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JUNE 1984

Canada's Personal Computing Magazine

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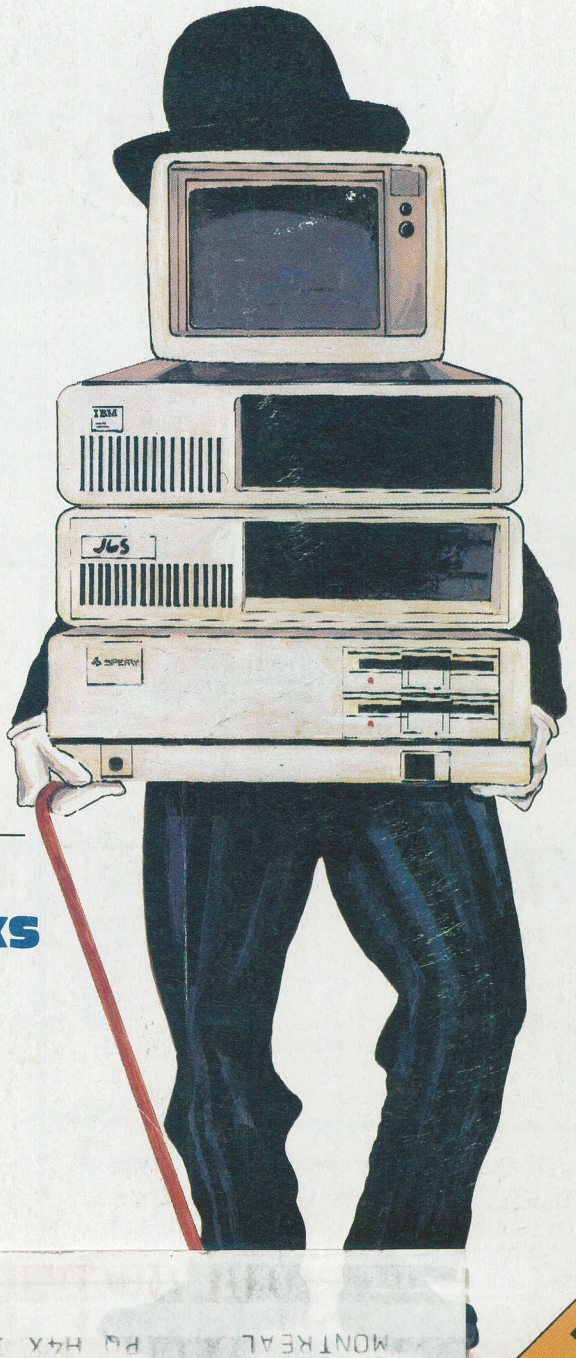

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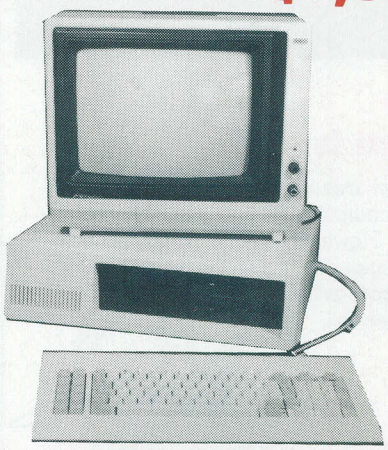

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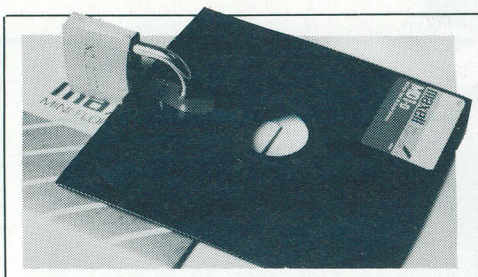
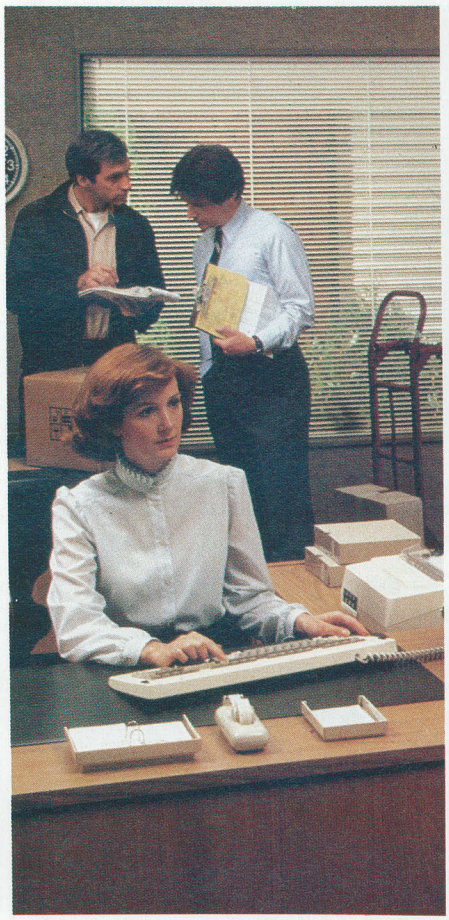


60
Nybble Copiers

The first thing that most programs want you to do is to back them up . . . all but the copy protected ones, that is. Here's a look at the software available for doing the last thing they want.



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What is MS-DOS?

PC Now!

We're pretty sure that it came from another dimension through a factory defect in the fabric of time. However, it's the nexus of the IBM PC none the less, and, as such, fairly important.

54
Rescue Your 64

It's a sad thing, seeing a grown programmer cry. However, if you've ever had to trash a hung computer when it's full of code you'll know how easy it is to come to tears. Consider this alternative.

64
Stockboy III

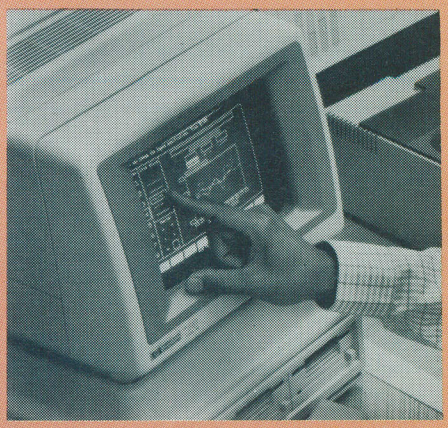
After many hours, nay, eons of debugging the third module of Stockboy lives. This one will print out packing lists and report on the status of your stock.

71
Charts Unlimited

CAD programs are like word processors for images. This one, while not immensely powerful, does produce nice looking pictures from the fruit of your choice.

Departments

Next Month in Computing Now!



HP Touch Screen Review

Even kids can point . . . and while you have to know how to do a bit more than this to use the HP Touch Screen computer system it's still a lot easier to cope with than machines that are largely keyboard oriented. This sophisticated computer and its attendant custom software will be scrutinized in the next issue.

Big Mac

Imagine a higher level language which is completely customized to your application, is infinitely flexible and produces code as tight as that which spews forth from an assembler. Yes, of course nothing like that exists, but it can, because if you understand macros you can write it for yourself.

Portable Computer Survey

Being able to pick up your system and boogie is a definite advantage. Machines that wander are becoming quite common; we'll be looking at just what's available . . . and what it costs . . . in the next issue of Computing Now!

JoyGraf

Graphics packages are everywhere but this one has the advantage of being low cost . . . in fact, it's free. It allows you to create and store high resolution images with magnificent ease. It has splendid potential for doing abstract art too . . . just tie a hamster to the handle of the joystick and let the cat in.

Educational Software

If you have kids you've probably noticed that they're a lot more interested in computers than they are in text books. Capitalizing on this observation the educational software industry has evolved to create quite a number of computer aided instruction packages. A tutorial appears next month.

Dialog

It's another of those "what computer should I buy" problems, I know, but I really wonder if I should be looking at a low cost Apple compatible system or one of the IBM workalikes.

It's a reasonable question. Nobody wants to sink a few grand into a computer... not to mention the time invested in setting up data files or writing programs, only to discover that it's obsolete. Worse still is finding that the thing won't really do what you had in mind. It's a very important choice.

The PC compatible systems, even the cheap ones, still seem to cost about twice as much as the Apple clones. Now I know that they have sixteen bits, more memory and all, but what does that really mean in terms of using one for real world applications?

In a straight comparison between the IBM and the Apple, the IBM is nicer machine. It has more features and none of the patched feeling of the Apple... the Apple][+ is after all, a very primitive computer into which a lot of extra hardware must be plugged in order to make the whole mess act as a serious system. When you finally get CP/M going on an Apple and boot, say, WordStar or SuperCalc, you know that the thing is just barely up to the task.

How do the limitations of the Apple show up then?

The lack of memory is one. Most users get 56K CP/M... there is a 60K version around though, which means that there is relatively little room for programs which gobble lots of RAM. Spreadsheets will be particularly affected by this. Even the low cost PCs have a hundred and twenty-eight K and you can add up to a half megabyte on most. The screen will appear to update very slowly on an Apple, even more so than on an IBM, which is none too swift itself. Most crippling though, is the severely limited disk space on an Apple. A formatted CP/M disk offers one a mere hundred and twenty-six kilobytes. It's dead easy to fill that up in no time at all.

How much do you get on a PC compatible?

Usually you have about three hundred and forty K per drive. However, beware the low cost systems with single sided drives... they chop you back to a hundred and sixty.

Can programs which run on the Apple be used on the PC?

No... not directly, although there is a card available which plugs a sort of Apple simulator into the IBM and lets it deal with some Apple software. However, most of the business packages which are available to run under Apple CP/M are also around in PC compatible forms. These include WordStar, dBase II and SuperCalc.

What about BASIC on the PC?

The BASIC which comes with the PC is by Microsoft, the same company which packages CP/M for the Apple. It is among the finest BASICs we've seen, with full screen editing, a rich graphics and communications vocabulary, and heaps of other bells and whistles. If you're thinking about BASIC programming, the PC is a much better choice.

One of the things that I've been told is that the Apple is more reliable because it's been around for so long. By now all the bugs are out of it.

That's largely true... if you are thinking about buying a real Apple][+. The clones however, are all at least somewhat redesigned. Many seethe with bugs which have been added during this process. By comparison, the order of magnitude of greater complexity in an IBM compatible, has required that they be designed and built under more strict conditions. We seem to be seeing PCs having better workmanship.

Do you see the prices of IBM compatible systems coming down in the next few months?

Oh, I should think they will somewhat. However, most of the Canadian builders have been running with fairly low margins as it is, and the chips will probably be in short supply for the rest of the year, so their prices are nearly at the bottom of the barrel now. We will probably be seeing Taiwanese IBM compatibles, but judging by many of the Apple clones floating in, these will probably not be as well built, and as such, as reliable as their Canadian competition.

It sounds like I should be buying a PC.

I wouldn't leap to that conclusion immediately. The Apple compatibles are still a lot cheaper. They make fair to middlin' word processors, great hacker machines, and are wicked at games. The PCs are all round better computers, but you should be sure you aren't considering buying one just to have the highest possible tech.

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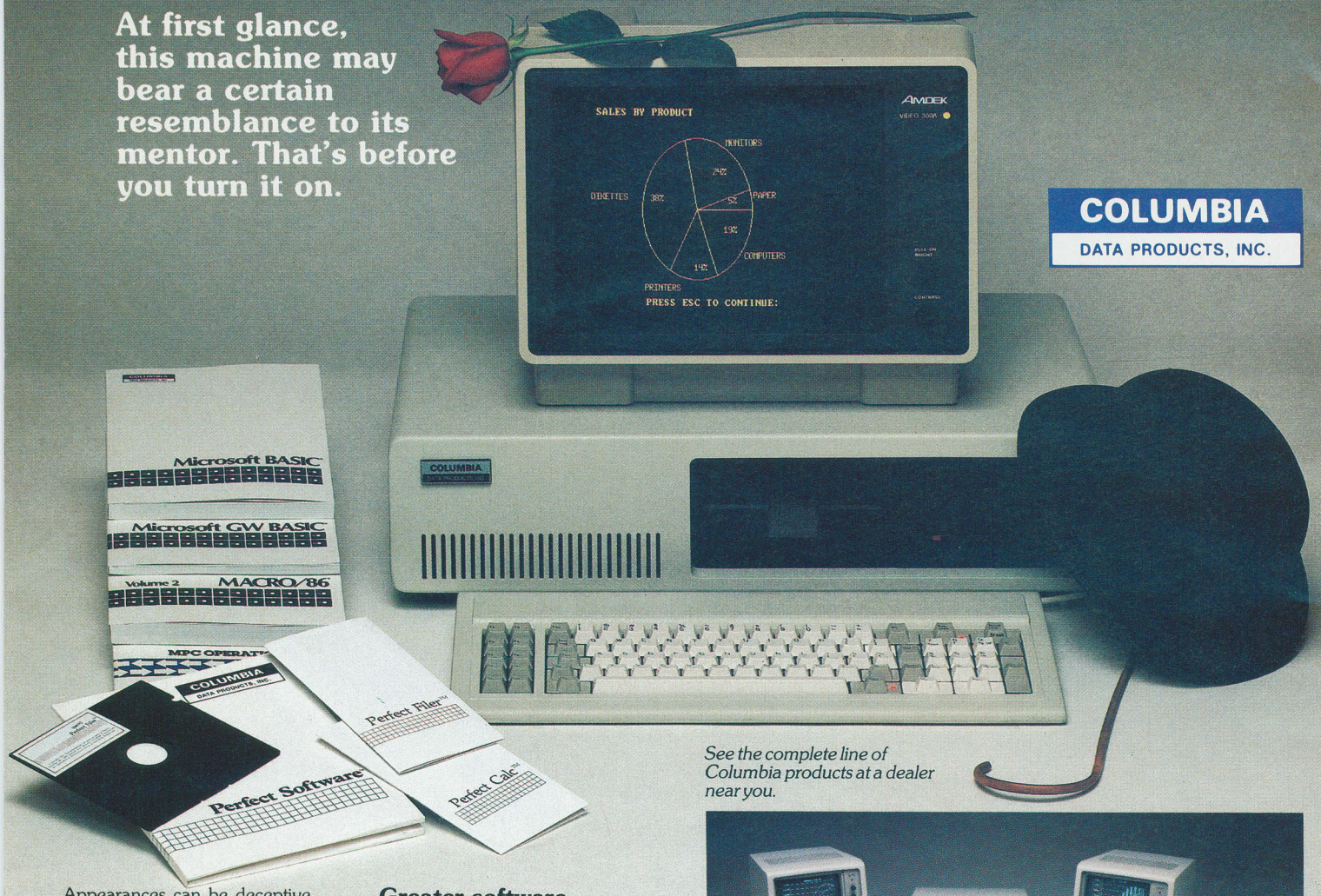

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Bulletin Board

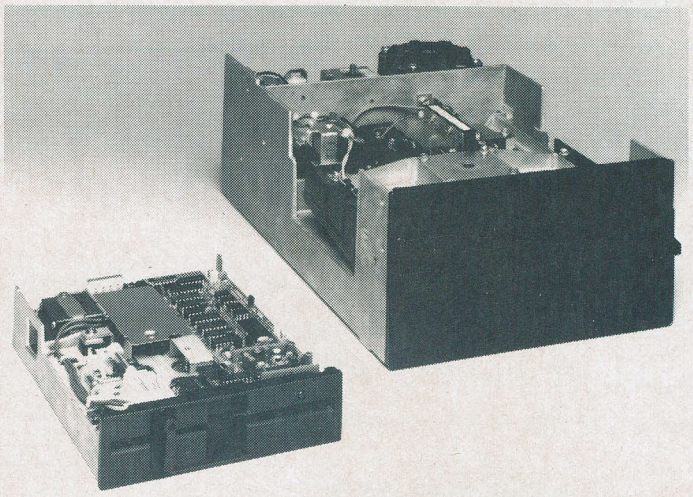
Sweet Micro Systems have produced one of the first peripherals for the Apple //c. The **Mockingboard //c** , which plugs into one of the computer's ports, gives users the same speech and music capabilities that Apple //e owners get from the Mockingboard card...

IBM PC programmers may be interested in an **EPROM programmer** from *High Tech Plus*. The Canadian product comes on a card, uses zero insertion force sockets and includes a complete supporting software package...

The **NABU Network** is now available to all Ottawa cable subscribers. The network, which allows cable users renting personal computers to access entertainment, educational and general information interactively through their television sets, is planned to expand across North America...

Able One Mailing List, an inexpensive program for computers operating CP/M 2.2, is now being offered by *Able Data Software*. The software provides unlimited capacity, but requires forty-eight K minimum memory and two disk drives...

Portable computer programs, once limited to tape storage only, can now be saved on disk. The **Percom Portable Disk Drive**, from *Percom Data*, has a storage capacity of three hundred and sixty K and connects to most portables by their RS-232 ports...



The **Shugart 475**, a double sided, half-height, five and a quarter inch disk drive recently introduced by *Shugart Corporation* provides over one and a half megabytes of storage space. Its data transfer rate is five hundred kilobits per second...

Frontdesk, a motel and hotel software registration system, is being distributed in Canada by *NAPAC Software Distributors*. Written in dBASE II code, the system is available for a variety of microcomputers...

Spellbinder, a popular word processor and office management system, is being distributed in Canada by *Remtek*. Features of Spellbinder include mail-merging capabilities and an integrated calculator function...

Comway Electronics Corporation have introduced a multi-purpose enhancement board for the IBM PC and PC XT. The **ComColor** card provides a colour/graphics adaptor with RGB and composite output, light pen support and serial and parallel interfaces...

Three new letter-quality printers have been introduced by *Amdek Corporation*. The **5000 Series** consists of twenty-five, forty and fifty-five characters-per-second models that operate at a low noise level of fifty decibels...

Users in low-humidity environments may be interested in **First Touch**, a static control pad that rests under the computer. Manufactured by *3M Canada*, the pad drains any static charge picked up by the operator...

Davka Corporation's religious games and educational software for the Apple, Commodore, Atari and IBM computers are available in Canada from *Israel Book and Gift, Ltd.* One of the many titles listed is **Bible Baseball**...

IBM PCjr users purchasing additional RAM will soon be able to use **Lotus 1-2-3**, the popular three-in-one business software package. *Lotus Development Corporation* will be providing an installation kit that will allow the PCjr to run the PC version of the product...

Hewlett Packard has introduced a compact speech synthesizer that can be attached to a computer or used with terminals and other peripherals. The paperback-sized **Speech Output Module** has a fifteen hundred word vocabulary, with fifty sound effects...

Hayes Microcomputer Products have announced the Canadian availability of the **Smartmodem 1200B**, a one-board modem for the IBM-PC. The direct-connect modem takes up one slot, and is bundled with Smartcom II terminal software...

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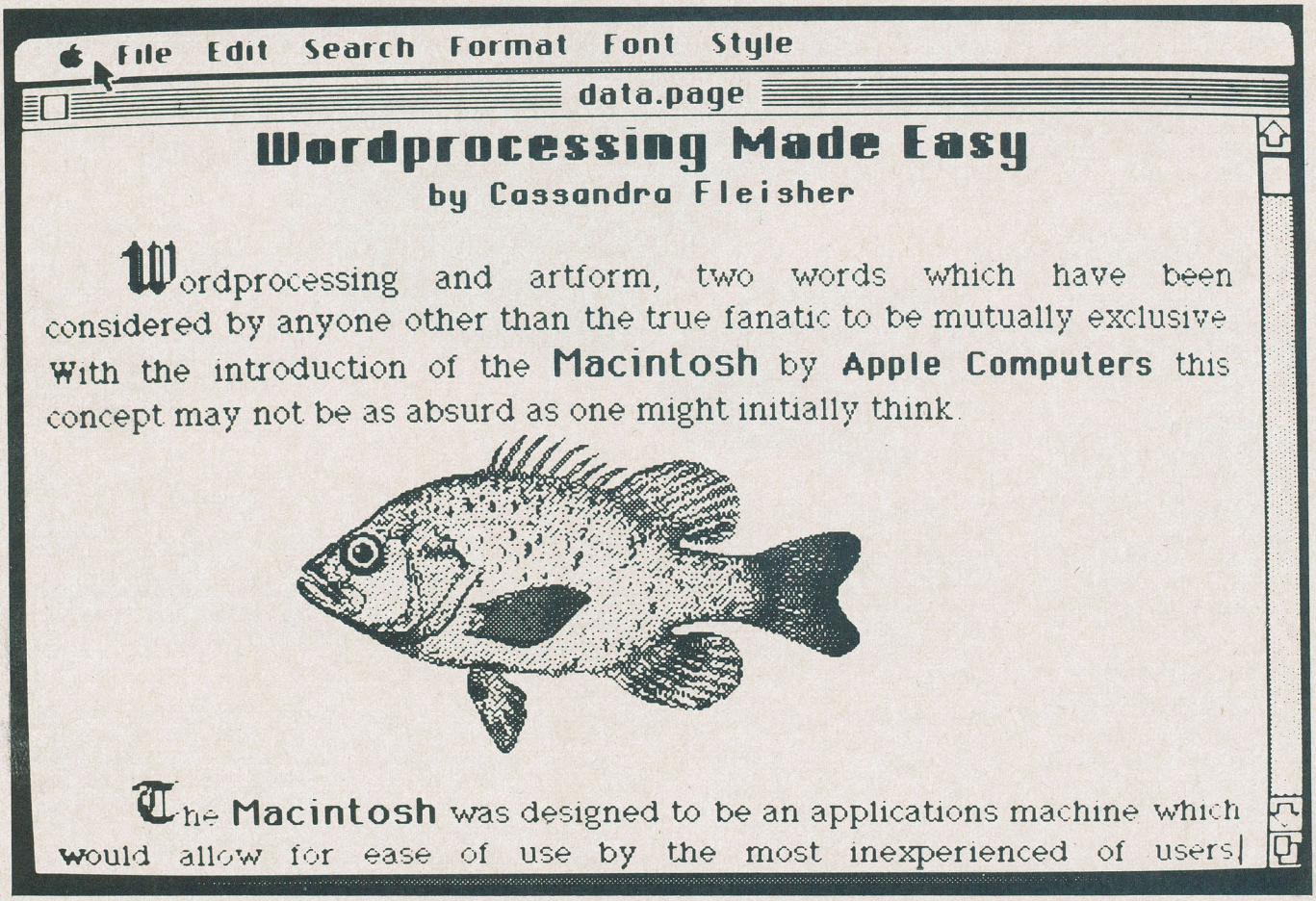
MacWrite



Like everything else about it, the Macintosh's word processor is a collection of superlatives. Here's a look at some of them.

by Cassandra Fleisher

As art forms go, word processing would probably be considered about two notches above sandblasting by anyone but a true computer fanatic. What one types into a micro computer may be cultural nirvana but the medium itself is no more artistic than paper, pens and correcting fluid.

Macintosh users might disagree with this. MacWrite, the system's bundled word processing package, can transform simple text files into illuminated manuscripts, resplendent with varying type sizes and fonts and a variety of special effects. Far from simply making documents more readable, MacWrite makes them attractive.

The more important facet of this watershed effort of human engineering, however, is its ability to remove all vestiges of drudgery from the process of writing. The facilities of MacWrite allow the author to manipulate text more effortlessly than ever before. The process of putting ideas on paper can be as effortless as that of coming up with them.

In addition to this, MacWrite is easy to use, and, more important, easy to begin using. Let's have a look at some of its facilities.

Field Mice

If you've experienced other word processing packages you'll notice a number of things in MacWrite that *aren't* there. First and foremost, there are no control codes to learn, remember and then forget if you have been away from your work for more than a day. Instead, learning to use the system is largely a matter of learning to use the mouse.

The Macintosh mouse is a small box connected to the computer which allows you to control the system's cursor movement. Move the mouse on the table top and there will occur a corresponding movement on the screen.

The cursor can take many different shapes depending on the application you're using... it's generally an arrow when used to implement commands or a vertical bar when inputting text. Whenever you want to implement a command, click the button on the top of the mouse and the system will interpret what you do as being a command.

MacWrite is loaded into the computer by pointing the cursor... remember the mouse... at the corresponding icon on the screen and clicking its button. An icon is a pictorial symbol that might represent a file or a program or a command for that matter.

Once you have the package running you'll find that you are faced with a blank page or document window. The ever present menu bar will be showing across the top of the screen and a ruler with a variety of icons or symbols will appear just below. The document name, "Untitled" at this point,

will be centered just above the ruler.

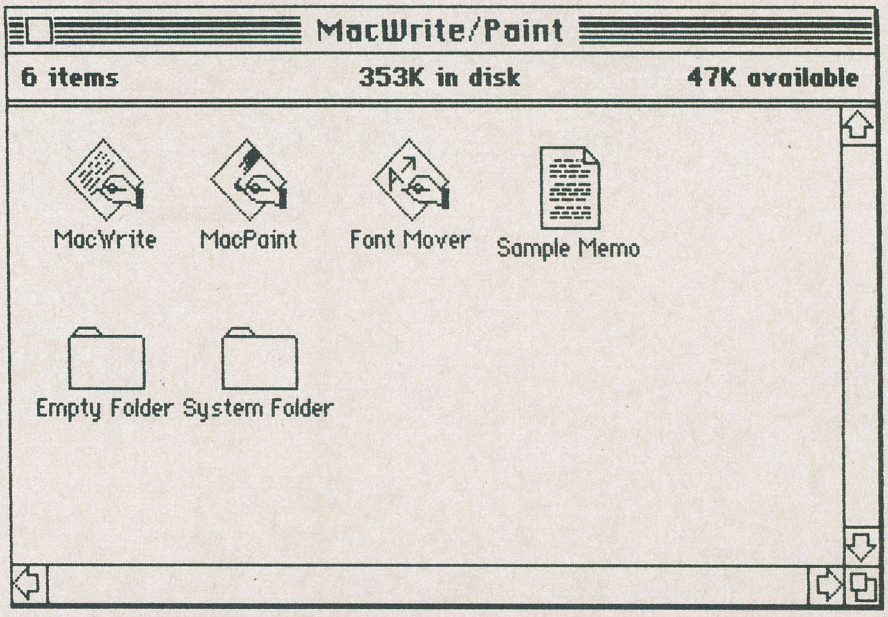
You will now be faced with a variety of choices. You could start entering text immediately and worry about its format later, or you could drive right in and select some fonts, styles, formats and sizes. The system won't mind... you'll probably get a feel for how things work best for you after some practice.

Before you actually begin to type it is always a good idea to be able to recognize the cursor. This should help in giving you some indication as to where you are and what you are doing. While you are actually on the page the cursor takes the form a thin flashing vertical bar. Text is placed wherever you have clicked that bar into position. At any other time the cursor is black arrow which can be used to point at the command or icon you wish to implement.

The ruler represents the six and a quarter inches of page width you have in which to enter text. This brings us to one of MacWrite's limitations. The largest area you have for text entry is those six and a quarter inches. This is not a major limitation but something one must be aware of when planning the format of a page of text.

To begin formatting your page, place the arrow cursor on the black triangle and move the margin. The little dart represents the paragraph indent or outdent. Small white triangles are used as a supply of tabs. These can be dragged and placed at any point on the ruler. Triangles with tiny dots in the centre are decimal tabs. Again, click on the mouse, drag to the designated point and away you go.

MacWrite has all the attributes now considered standard on the more popular wordprocessing programs. It has wordwrap and scrolling, block moves and miriad formatting capabilities. Nine character fonts are available for selection. These fonts can be used anywhere within a document at any time. The page itself can be reformated even in mid paragraph. Thus, you can mix full justification with center justification with different margin settings and so on.



This is the main menu. To invoke MacWrite one would move the cursor to the MacWrite icon and click the mouse.

Once you have decided how you want your page to look, you can move the cursor to the print menu. You will be faced with a dialog box offering various choices as to how the document should actually be printed. You can select how many copies you want, the page range and the quality of the print. Draft mode will give you text only in one font size. This method will give you a quick and dirty copy of your text. Standard quality offers screen quality printing and is still very fast. High quality is painfully slow but the text is as close to letter quality as you might ever expect on a dot matrix printer.

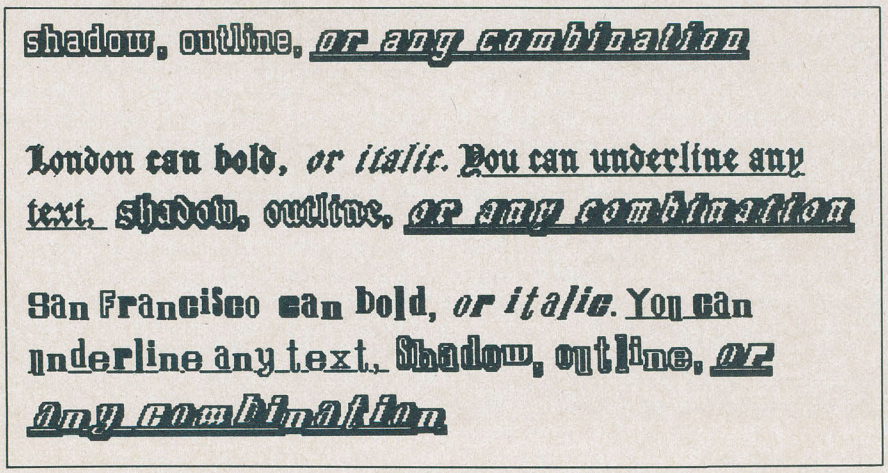
Ed's Window

Opening the edit menu window offers you a whole new variety of choices. You can undo changes, cut, copy, paste and toggle the showing of the clip board.

The clip board is exactly what it seems to be... an electronic place to temporarily store data that you will be using in the near future. It can be used within a program such as MacWrite where you are changing and repositioning text. It can also be used to interface between programs, to bring data in from a completely different application, such as a spreadsheet, to be used as presentation material in your document.

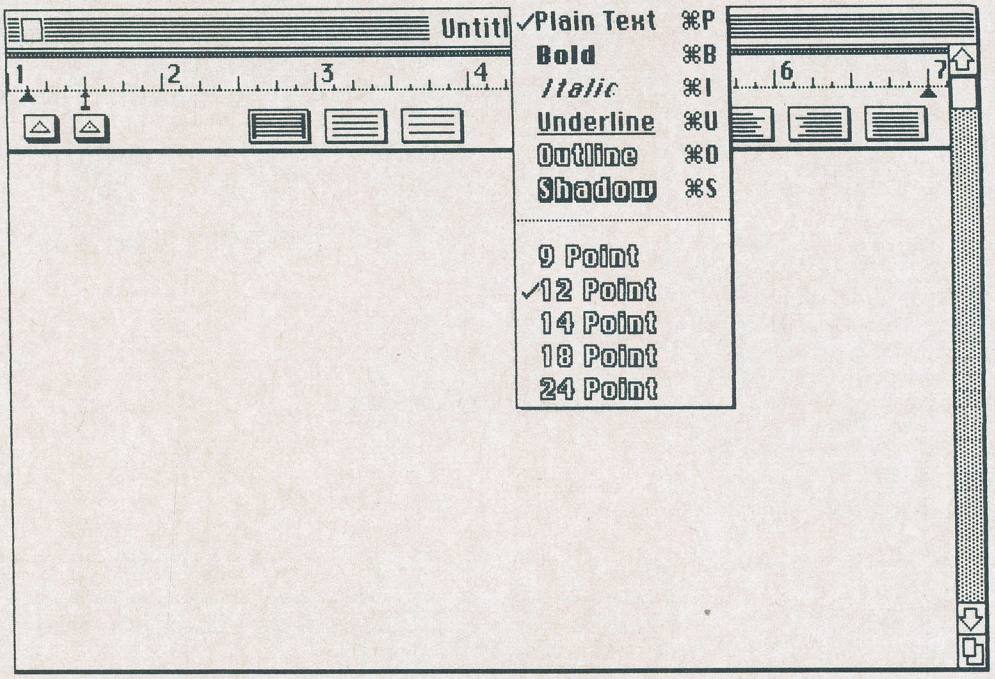
Editing with MacWrite is particularly easy. Insertion of text takes place from wherever the cursor is positioned. In essence you simply move the cursor to the point where you want to add text and begin to type. All the existing material will be pushed over and reformatted in order to accommodate the new information.

There are three different methods of



This is a sampling of the fonts available under MacWrite.

MacWrite



This is one of the system's pull-down menus, showing the current type format defaults.

deleting text from the document. The simplest is through backspacing over the soon to be late characters. You can also mark a section of text by moving the cursor to the beginning point of the offending passage, clicking the mouse and dragging it over the portion to be removed, leaving the marked text in inverse. If you start to type at the end of the highlighted passage the marked text will disappear and be replaced by the new information.

Finally, there is the cut command. Highlight a passage, move the cursor to the edit menu, click the mouse and drag it to cut out a block. However, it has not completely vanished... Macintosh will have taken this material and moved it to the clip board where it will stay until it's recalled or replaced by the next piece of cut copy.

The "show clip board" command allows you to see exactly what you have saved and is now waiting for positioning. Thus you can check to make sure that the passage you will be losing by making another cut is not invaluable.

The Searching

The search function on the menu bar allows you to do just that. You can find and replace character strings. Once again you are given several options for this feature through the dialog box. You can find the next occurrence of a string, change it or find and change all the occurrences.

Although this function is as easy to use as the other Mac features it shows some limitations. For example, it does not make any case differentiation thus changing or finding a word regardless of how it is capitalized.

Icons representing the date and time can be placed in either the document header or the footer. Thus, your document will always accurately represent the correct date and time that the wordprocessing took place.

The remaining commands on the menu bar, font and style, are the areas that give the Macintosh and MacWrite their uniqueness in the word processing world. Through font you can select the type of print in which your document will appear.

Some of the fonts are meant for text and are best when displayed in the smaller type sizes. Others are display fonts best used for titles or for decorative effects. However, you're free to make as much of a mess of things as you care to... any of these nine fonts can be mixed and matched on your page. You can also vary their sizes, ranging from nine to twenty four point.

Finally, each of the fonts can be altered with the style menu. You can highlight a portion of the text and make it bold, or give it a shadow... there are quite a few permutations. In addition, you can interface graphics developed with MacPaint with the documents you design.

McNuggets

There are several limitations in using MacWrite and, while they do not detract from its function as a superb word processor they are worth taking into account if you envision some sort of fairly unusual application for it.

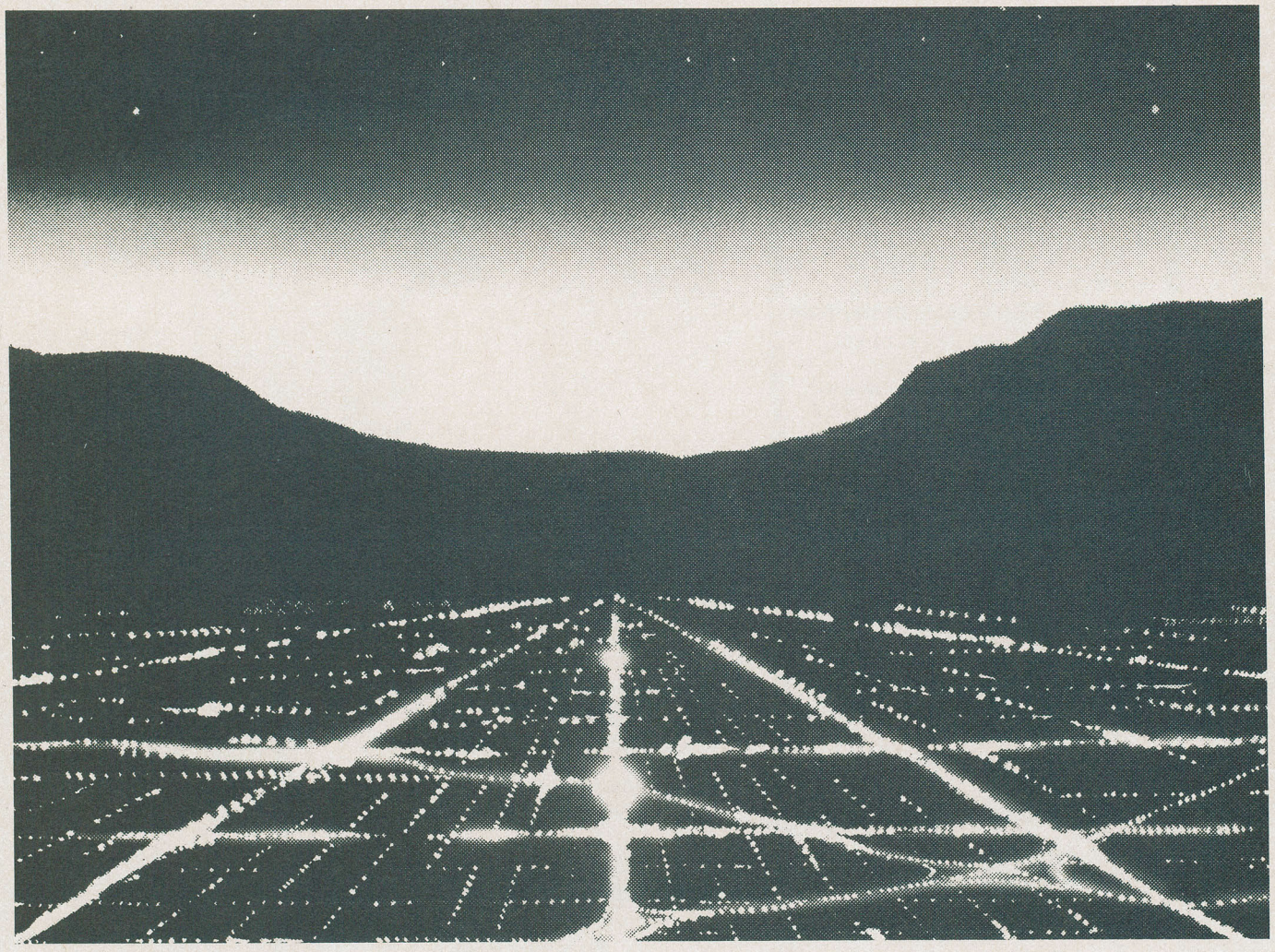
As mentioned earlier the limit of the system's actual text width can prove to be a problem. MacWrite does not allow for mail merging at present. Since multiple mailings of form letters is a common requirement for word processors this can prove to be a major disadvantage.

MacWrite does not allow for subscript and superscript nor does it print in an extensive multiple column format. Another problem is the fact that only twenty-seven thousand characters of text can be stored per document, or about ten single spaced pages. Thus, a lengthy document must be entered in two or three files.

For the average author, though, word processing with MacWrite is an experience. If you've gotten used to using a typewriter you'll wonder if the second coming has taken place and nobody told you. Even owners of powerful word processing systems, such as Wordstar, will find MacWrite an order of magnitude more productive a tool.

And all this time you probably thought that mice were only good for running mazes. **CN!**

What is a LAN?



In the old days, when computer programmers used screwdrivers instead of terminals, it was noted that having lots of people use the same computer at the same time was an excellent way of fending off creditors without becoming murderous. So it can be today.

by Kevin Fraser

Back in the days when a computer was a large holy monument to technology... before its definition was changed to include something about desktop sized... the suits got together with the computer fellows and they came up with a deal called *time sharing*. A relatively large number of businesses could have terminals installed, and, through the telephone network and modems, share time with each other on a single mainframe computer which was located in the mystical land of somewhere else.

When computers got small and powerful, time sharing stopped being the only way for companies to have data processing. However, when everyone got their own micros everyone also wanted their own peripherals. Peripherals, especially esoteric ones like plotters or data aquisition devices, often cost more than the computers that drive them. Micros also made it difficult for users to share data, something which mainframes have no difficulty with at all.

All this has led to the development of what have come to be called Local Area Networks. If you shovel away all of the bits that go along with this concept you have a fairly simple idea. Given a LAN package you can allow a room full... or a corporation full... of computers to all share each others' resources.

Of course, those bits can't stay shoveled forever... they're the little details that make all this stuff more complicated than it seems.

Share the LAN

The idea behind a LAN is pretty much the same as that of a big mainframe. At one end of the system you have a rather well endowed personal computer. It usually has a hard disk for lots of storage, printer and maybe plotters and perhaps a modem connected to the outside world. It also has a special communications interface that is capable of spewing computer data into and out from the computer at prodigious rates. At each of the various other ends of the system you have a microcomputer or terminal that is equipped to talk to the other devices in the system at the same prodigious rates.

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What is a LAN?

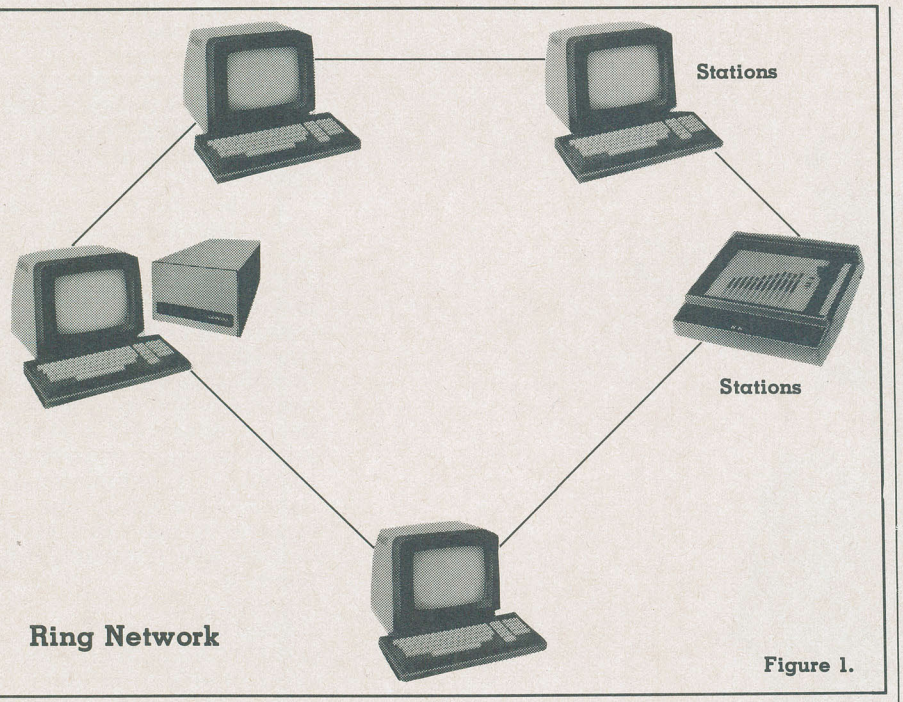

Figure 1.

everyone needs and the others are kept pretty well stripped. This reduces the overall cost of the system, but still provides plenty of computing power to each of the users because every user can access every other device in the network.

This, without any more fanfare, is a local area network.

The network part of a local area network boils down to a small telephone system that has been optimized for the transfer of computer data. Whenever your computer is talking to another computer on the telephone, it usually does so at the speed of about three hundred bits per second which is a little over thirty characters per second. If you can afford a high speed modem it will go twelve hundred bits per second.

The average office LAN is capable of data transfer rates that are orders of magnitude faster than this. The reason that the telephone system is limited in the speed of information it can fire off is because of the frequency response, or bandwidth, of the telephone network. As well, the phone system today is still largely analog and analog transmission of computer data is characteristically slower than are digital methods. It's also noisy, which means that it glitches data quite frequently.

In a LAN environment the whole of the network is designed to handle the highest data transfer rates possible. This is possible because of the use of coaxial or twinaxial cable to carry the information. Both of these cable types are shielded by a metal braid wrapped around the conducting wires. This way, they dispose of any noise they are bombarded by before the signals inside carrying the data can be corrupted.

Since the speed that information can be carried through a given cable is a function of that cable's bandwidth, the result is a much higher data transfer rate through the cable. Furthermore, the effective bandwidth of a cable is inversely proportional to its length... you have to move the stuff slower if you make the wire longer. A typical LAN involves distances of yards, rather than miles, which greatly enhances the speed at which it can work.

Ring For a Bus

This all brings us to the ways the wires can be arranged. There are basically three distinct methods of connecting a bunch of computer devices together for the purposes of local area networking. LAN salesmen will refer to this method of connecting up the machines as the LAN's *topology*. The first is called a ring network.

Figure one shows the basic topology of a ring network. Keep in mind that this diagram is not a detailed specification of any particular system, but just a way of getting the general picture into your head. Ring networks are quite common. VisiCorp, the huge software developer of such packages as VisiCalc, uses a modified ring network to link up their fifty odd programmers' micros to their three DEC VAX 750 mainframes.

One major drawback in a ring network is that if anybody's station gets disconnected, the entire network goes down until they find the butter fingers who accidentally yanked the connector out. This has actually happened to VisiCorp, but it's a minor problem if the system only has a few stations and they're all close together.

An improvement over ring topology in a LAN is star topology. Check out figure two. In a star configuration, the connections between the stations go through a *dedicated controller*. This is a specially equipped computer whose only purpose in life is to direct the data traffic in the system and to bypass any unit that gets disconnected or doesn't act the way it should. Great improvement over ring topology, this; it eliminates a lot of downtime in a system that has many users in different places. Naturally, you pay for the improvement.

The third type of local area network topology, shown in figure three, is called a distributed or *bus* system. This is one of the most widely used network topologies. It is a passive system, requiring little connecting hardware and therefore little maintenance.

The advantages of the bus system are several. It is easily modified; stations can be added to or removed from the LAN without disturbing its operation and the failure of one or more of the stations will not affect the operation of other stations in the LAN. Xerox's Ethernet and Radio Shack's Arcnet both use forms of bus topology.

I Can See For Miles And Miles

There are some drawbacks to all this raw, unbridled computing power. The first is noise... the radio frequency sort. This noise can't be heard by humans, but radios, TV's and, yes, even computers have been known to get a little confused by it.

The noise is caused by stray electrons being bashed out of the cable and into the air by other electrons carrying information hither and yon at very high rates of transfer. A digital pulse, you see, is comprised of a fair amount of energy in the radio spectrum, and, in many cases the cables of a LAN can make excellent antennas.

That's right, the computer can foul itself up with its own electronic noise. Add to this the general melee of cosmic noise that is constantly present around us... TV signals, radio, satellite broadcasts, mathematical representations of five note musical sequences transmitted to French scientists by

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long, tall, thin white dudes with huge eyeballs... you get the picture.

To overcome this problem the designers of the systems have found it necessary to use shielded coaxial cable, as we've seen. The cable used in these types of systems looks not unlike the length of cable that is often occupied in the household to keep the family tube connected to the cable TV company.

There are two types of data transmission used in local area networks. One uses standard the same type as cable TV companies use. It has one conductor and is used in *baseband* systems, such as Xerox's Ethernet. Baseband transmission means that the data signal is not being modulated onto a carrier. In other words, only one physical signal can be going anywhere at any given time.

Baseband systems are often passive networks, meaning that the system is basically a bunch of wires connecting the machines together that you can tap into at any point with little or no adjustment required to the rest of the system. This makes expanding the system at a later time idiotically simple.

The other type is a rather expensive variation on this called *twinax*. IBM loves twinax. It gets its name from the fact that it has two conductors instead of one that are twisted around each other inside the shield. Twinax cable is used in *broadband* systems. It's much better at rejecting noise than coax and can carry data at much higher rates than baseband systems.

Broadband systems use *active* data transmission techniques that employ line amplifiers, frequency converters, hubs and other powered implements. A broadband system can move a lot more data in a given period of time than can a baseband system, but it requires a lot more maintenance and adjustment to keep it operational. These things also have a lot more wire hanging off them. Adding another station or device to the network usually requires heavy surgery.

Broadband systems are, not surprisingly, severely more expensive than baseband systems.

Considering that each computer on the system needs at least one connection to the cable, you can imagine what this could do to the appearance of the average multiple office business. LANs require the installation of enough cable to connect all the stations concerned. The manufacturers specify maximums of a few miles or kilometres. If you want a local area network you'll need to have a lot of coaxial cable installed.

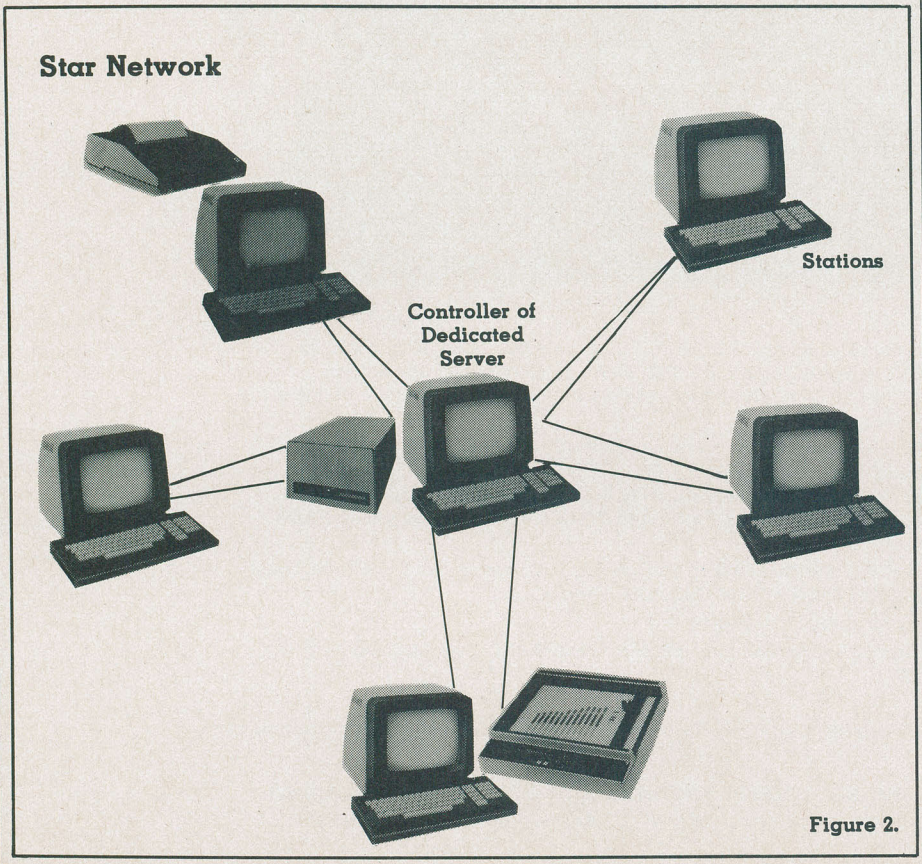

Figure 2.

Terminal Emulation

"Look, Martha... There's that *word* again!"

Terminal emulation is a concept that makes bosses buy lunch for staff and strikes terror into the hearts of terminal manufacturers everywhere. All it means is that your existing microcomputer can be made to act like the most sophisticated terminal with relatively inexpensive software and interfacing.

Many mainframes use protocol schemes for communicating with terminals that are down right nasty to get working properly. These schemes are called *synchronous* communications, as opposed to *asynchronous* communications, which is what bulletin boards and dial ups and other plebean hardware uses.

Synchronous communications in a broadband LAN allows you to do things like have seven printers outputting the same file at once while you are transmitting disk files to someone and simultaneously having a keyboard to keyboard chat.

Formerly the communications protocols and handshakes which are the electronic ground rules in a LAN were built into the terminals in hardware. Today there are general purpose microcomputers that can simulate through software the functions of the dedicated terminals, in addition to doing spreadsheet and word processing applications or whatever else you normally use your micro for.

What this means to the end user of a business LAN is that with just a few keystrokes, you can send the information you've just processed, or the memo you've just written, or the report you've just generated from someone else's data to any or all users of the LAN, without losing the other functions of your micro and without leaving your desk.

Standardizing Standards

Despite the rather stormy seas in the OEM LAN market, there are some leading contenders appearing on the LAN horizon. Radio Shack's *Arcnet*, for Attached Resource Computer NETwork system, and Xerox's *Ethernet* are two of the most visible ones.

Arcnet is based on Datapoint Corporation's ARC system that was developed about five years ago. Both Arcnet and ARC are in fact trademarks of Datapoint Corporation. Radio Shack has a licensing agreement with Datapoint Corporation to use their technology.

Businesses that have purchased Radio

Bus Network

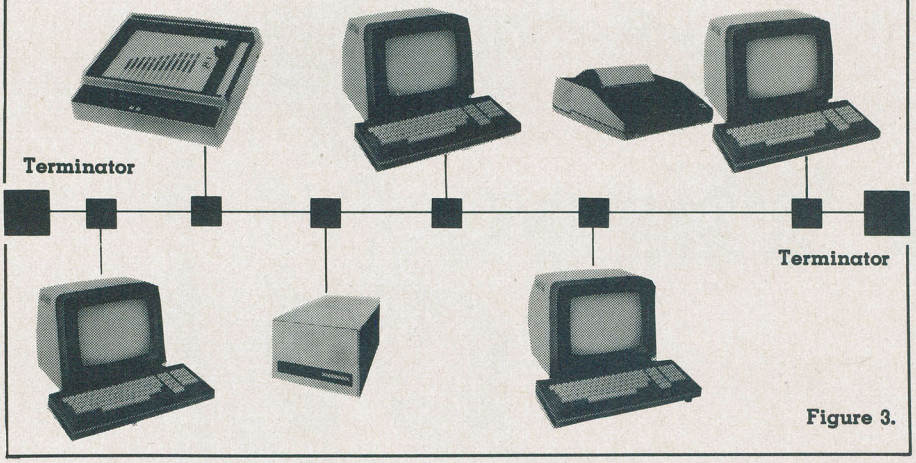

Figure 3.

Shack model two or model twelve computers can include these machines in an Arcnet LAN with the addition of a communications board, a hard disk interface for model twos and of course, coax to taste.

The software end of the Arcnet system is contained in a package called the file processor software. This software runs permanently on whichever computer has the hard disk. The machine that runs this software becomes the file processor and is not usable for any application while it is operating the network. It becomes the dedicated controller.

And in This Corner

Ethernet has been in the research phase for over ten years now by the combined efforts of Digital, Intel and Xerox. Rather than selling a specific system, Xerox is trying to establish Ethernet as a standard for LAN system design. They are licensing the right to use Ethernet protocol and specifications to any company that wants them for a nominal fee.

The Ethernet standard is a detailed plan for sending information from one node on a LAN to any or all of the others. A node is any terminal, microcomputer, printer, hard disk system, plotter, modem or other device that is equipped with the proper interface to talk to the Ethernet. Ethernets can be connected together into larger Ethernets through what Xerox calls a *gateway*.

The data being sent is broken down into *packets* of about fifteen hundred characters. These packets contain all the information about where they are headed, which node sent them and system information.

Whenever an Ethernet node wants to send a message it checks the channel, in this case the coaxial cable, to see if any other node is talking. If some other node is using the system, the first node waits until the channel is clear before sending its fifteen hundred character long packet of information. It could send any number of packets, but only one at a time.

Plugging In

There are other LAN systems available, of course... it looks to be a juicy market. There are also heaps of others planned. None are in the least bit compatible with the any of the others. Many are very particular about the hardware they'll talk to. If you have more than one type of computer currently and you want them all to be nodes on your LAN you may have only a few choices that will be compatible with all your toys... or maybe just one... or very likely none at all.

LAN technology makes the otherwise horrific task of choosing a computer seem like ordering lunch by comparison.

The power of a LAN can be a great adjunct to any business with more than a few computers. The obstacles involved can be humongous, though. Furthermore, as is the case with most infant technology, you run the risk of buying a system which will become obsolete and get left behind. It's very hard to know which system will become *the* standard.

There's nothing worse than having twelve miles of coax buried in your place only to discover that it has become unfashionable.

CN!

Hexes and how to Throw Them

The number system beloved by computers everywhere may seem like it was deliberately intended to fox human beings. In fact, it just happened that way. The reality of the situation is that people were made to be difficult for computers.

by Steve Rimmer

Computer numbers... those nasty little expressions which crop up in most of the so called user friendly manuals every few pages... are not quite so horrific as they seem to be. Yes, I know, they have letters in them where there should be digits... and they add up funny... but there's actually some sense behind them. If you understand what they mean... and what all the funny words are up to... you can actually learn to like them.

We're going to have a look at the basis of computer numerology. You won't be able to tell your future from it, but, with a bit of thought you'll very likely be able to get your computer doing what you want it to do... without having to grow six more fingers.

Six more fingers would leave you with 10. Well, no... actually, that would be $10 or 010H... which, as we'll see, are rather different things.

Bit Picking

We're going to get into some fairly rudimentary stuff now which may sound a mite like one of those 1965 "become a computer programmer at home" books you occasionally find at garage sales. Don't sweat it... it'll get better in a few paragraphs.

This little gaffer is a bit.

○

Okay, then, it's a donut, but we're going to call it a bit. A bit can be either off or on. In this case we've let the off bits be open donuts and the on bits be filled in donuts. Another way to describe this is to say that the off bits represent zero and the on bits represent one.

Having one bit to play with we can count up to one. This is really fascinating and inutterably useless. However, with two bits we can count to four.

This is to say that two bits can express four unique states. Here they come...

○ ○	state 1
○ ●	state 2
● ○	state 3
● ●	state 4

If we allow that the first state represents zero, then we can count from zero to three in this way.

Four bits let you count to fifteen... they can express sixteen different states. Here's a look at a how that works.

○ ○ ○ ○
○ ○ ○ ●
○ ○ ● ○
○ ○ ● ●
○ ● ○ ○
○ ● ○ ●
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Now, there are a lot of ways to look at what's happening here. Electrically these bits can be represented by what are called flip flops. These are the basic structures in computer memories and counting. A flip flop is an electronic circuit which remembers the state of one bit. It has an input, called a clock, and an output which will be at the level... on or off... that happened the last time there was a change on the clock line.

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Hexes and how to Throw Them

This diagram shows a string of four flip flops in all of their sixteen possible states. If we allow that they are all at the off state to begin with... these ones work from left to right... clocking the first one will cause it to change state, coming on. Clocking it again will cause it to go off and pass the clock on down to the next one... which will turn it on. Clocking it again will turn it back on, and so forth.

This is very complicated and a bit useless actually, since no one even acknowledges the existance of flip flops any more. If it doesn't help you to understand this stuff ignore it. However, you may be interested to note that this, the most primitive form of computer mathematics, has given us our first incomprehensible technical term. It's called "binary".

There's a more useful way of regarding all this. Consider that each bit represents an exponent. An exponent is one of those little numbers which means "to the power of" and perches, parasitically, above a larger number.

In our own number system we work with exponents to the base of ten. That is, our exponents can be seen as being decimal places. The value one is ten to the power of zero. Ten is ten to the first power. One hundred is ten to the power of two, one thousand ten to the power of three... and so on.

The exponent, then, is the number of times you'd have to move the decimal point right to increase one to the number in question.

It's an arguable point that we use powers of ten because we have ten fingers to count on. However, ten is a very inconvenient number because it isn't an even power of two. Two is important because it's the number of states that can be represented by a bit. Computers are made up of the aforementioned never mentioned flip flops which, as we've seen, are very much into bits.

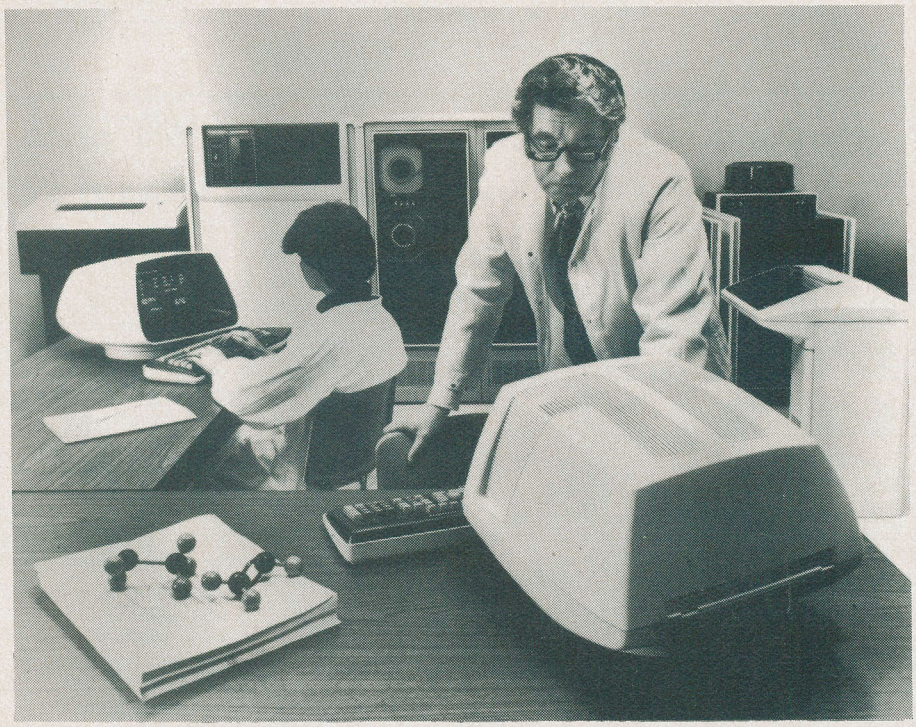
Early computers used a number system called "octal", which had a base of eight. However, this has some limitations when applied to the usual sort of microprocessors one finds in contemporary computers and, as such, we now pretty well always use what is called hexadecimal, or base sixteen.

We'll get into what this means presently.

Our four bit number back a ways can be seen as being a string of four flags which turn on and off the first four powers of two. For example, the bit pattern

● ○ ● ●

holds the number eleven. This can be figured out by observing that bits one, two and four are on. This means that to decode this pattern we would add two to the one plus two to the two plus two to the four... or one plus two plus eight, which comes out to eleven.



Nybbles

A four bit number such as the one we've been looking at is called a nybble. It can also be thought of as one hex digit. Digits in decimal... human numbers... go from zero to nine but, because there are sixteen different states for a hex digit we need some extra characters to take up the slack. Thus, hex is expressed as going from zero to the letter "F". "A" is ten, "B" is eleven and so on.

If you put two nybbles together you have a byte. A byte can have any of two hundred and fifty-six different states, having eight bits.

The way this works out, the first four bits, or the low order nybble, holds the hex "ones" and the next four bits, the high order nybble, holds the hex "sixteens". This is the same as it works in decimal numbers, except that the second digit represents the number of "tens".

A byte is represented as two hex digits. The number CF is a hex value which would be 207 in decimal. You can figure this out for yourself if you want. Split the byte into two nybbles, C and F. C is worth twelve decimal and F is worth fifteen. The high order nybble, C, is worth sixteen times the low order one, so the decimal value would be sixteen times twelve plus fifteen, or 207.

We're cooking now.

It's probably occured to you that eight bit numbers are related to there being two hundred and fifty-six characters in the ASCII character set that your computer can print. It's true. A byte is what most eight bit machines consider to be one memory location. Since a byte... and a location... have eight bits each a location can hold any number from zero to two hundred and fifty-five.

Now, you may be thinking that your system can deal with larger numbers. This, too, is the truth. However, it can't put a number larger than two hundred and fifty-five in one location.

The largest simple number most computers like to deal with is 65535. This is two to the power of sixteen minus one, or the result of adding up two to the power of zero through two to the power of fifteen. This is called a sixteen bit number, or a "word".

A word is simply two bytes side by side. You can look at this as being sixteen bits in a row if you want to. However, it's often useful to be able to look at them as two bytes as well.

Since your computer is oriented around eight bit numbers, words must be stored in two locations. The first eight bits go in the first and the second eight in the second. The

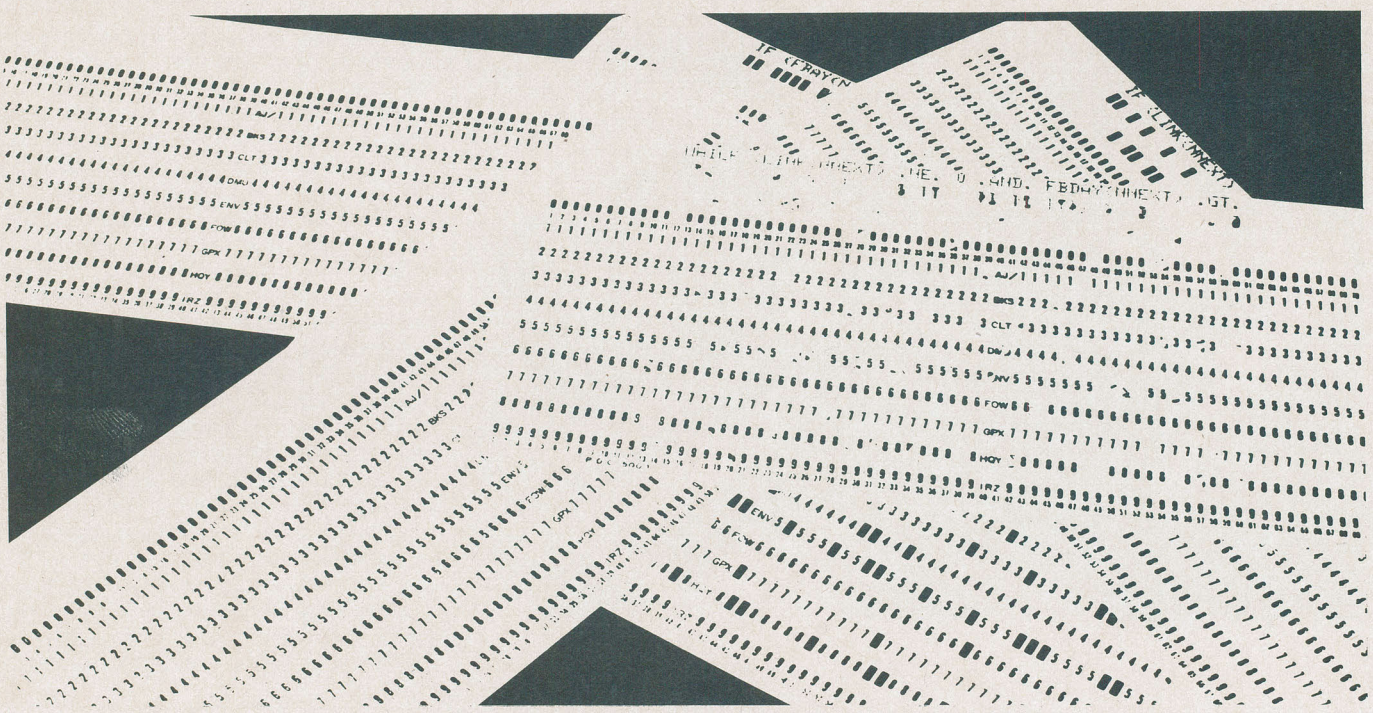
first byte can be thought of as holding the number of "ones", with the second holding the number of "two hundred and fifty-six's".

You'll find this in BASIC quite often when you have to PEEK a two location number. The value will be PEEK(LOCATION) + 256 * PEEK(LOCATION + 1).

The most common use of words at the level of your computer is in memory addresses. The microprocessor in your computer has to be able to address more than two hundred and fifty-six locations of RAM, so its address bus must be at least sixteen bits wide. This is done by it plunking out two bytes for each address. The first one is the number of ones, and controls the first eight lines of the bus. The second is the number of two hundred and fifty-six's in the address and controls the other eight lines.

It takes longer to produce a sixteen bit address than it would to manage an eight bit one, some some microprocessors have what is called a "zero page mode". There are special instructions which operate in only the first two hundred and fifty-six bytes of

Hexes and how to Throw Them



memory so that the computer can use a single eight bit byte to generate the addresses. These things are used when one needs to write very fast programs that work with relatively tiny amounts of memory. Sixteen bit processors can have up to thirty-two address lines using the same two byte address arrangement.. most only have twenty, in fact... which is why they can access more memory.

That big number, by the way... 65535.. is actually sixty-four times 1024, this being what is meant by one K of RAM. This is why eight bit computers can only address sixty four K directly.

Other Peculiarities

There are many other useful tricks involved in hexadecimal... most of which are a bit too involved for this feature. However, we can look at a few of the more puzzling aspects of daily interrelation with the hexoids.

A two byte word can hold a number from zero to sixty-five thousand and whatever. However, what your computer's BASIC calls this is another thing. The various versions of the BASIC language relate to the hex level of their respective computers in a number of ways.

A straight up two byte word is called an "unsigned integer". Some BASICs like to make this a signed integer, with the highest byte in the upper nybble being the sign. However, this means that there is one less byte to play with and, as such, one less power of two. A signed integer can be anything from zero to 32768.

Well, no, actually, it can be anything from -32767 to +32768. In other words, nothing has changed. We can still represent the same number of different states with the two bytes... we've just traded an order of magnitude for the ability to express negative numbers.

Systems using this sort of notation will usually express absolute values above 32768 as being negative. The Apple II+, for example, has its machine language monitor's entry call at -151. This would be 65535 – 151, or equivalent to 65385. You can use this call to enter the monitor if you want to, incidentally, although it's much harder to remember.

The other thing that will be worth noting is how hex numbers are expressed among various systems. While the zero to nine and A to F digits are fairly universal, there are a number of different incantations that go with them.

Some of the simpler BASICs simply won't accept hex representations unless you write hex converter programs to make sense of hex values expressed as strings. The more powerful ones, however, allow you to use a hex operator. Most of the time this is "&H". Thus, for example, to get the decimal value for hex CF you'd say PRINT &HCF.

These BASICs also generally have string functions that go the other way. PRINT HEX $(207) will return the number CF.

At the machine code level there are two often seen standards. Systems which are based on 6502 and related processors usually use a dollar sign to express hex. Thus "$69" is hex sixty-nine... decimal 105... while "69" is decimal sixty-nine. 8080, Z80 and 8088 based systems generally use the letter "H" to mean hex. Thus, one would say 69H, or, more properly, 069H, which is what some assemblers and other machine code tools like to see.

It's obviously important to denote the use of hex numbers, as many values don't contain letters and are, as such, indistinguishable from decimal numbers.

No Spells

Working in hex is a real drag for the first while. However, it makes your computer seem a lot more rational after you get the hang of it. At the very least you'll be able to figure out why everything you have to PEEK and POKE is at those wild addresses.

While a bit cumbersome by human standards, thinking in hex will allow you to work in something like the way your computer does... which is essential for making it do the more involved things it can get together for you.

Having no fingers at all you'll have a fairly difficult time make *it* think like a human being.

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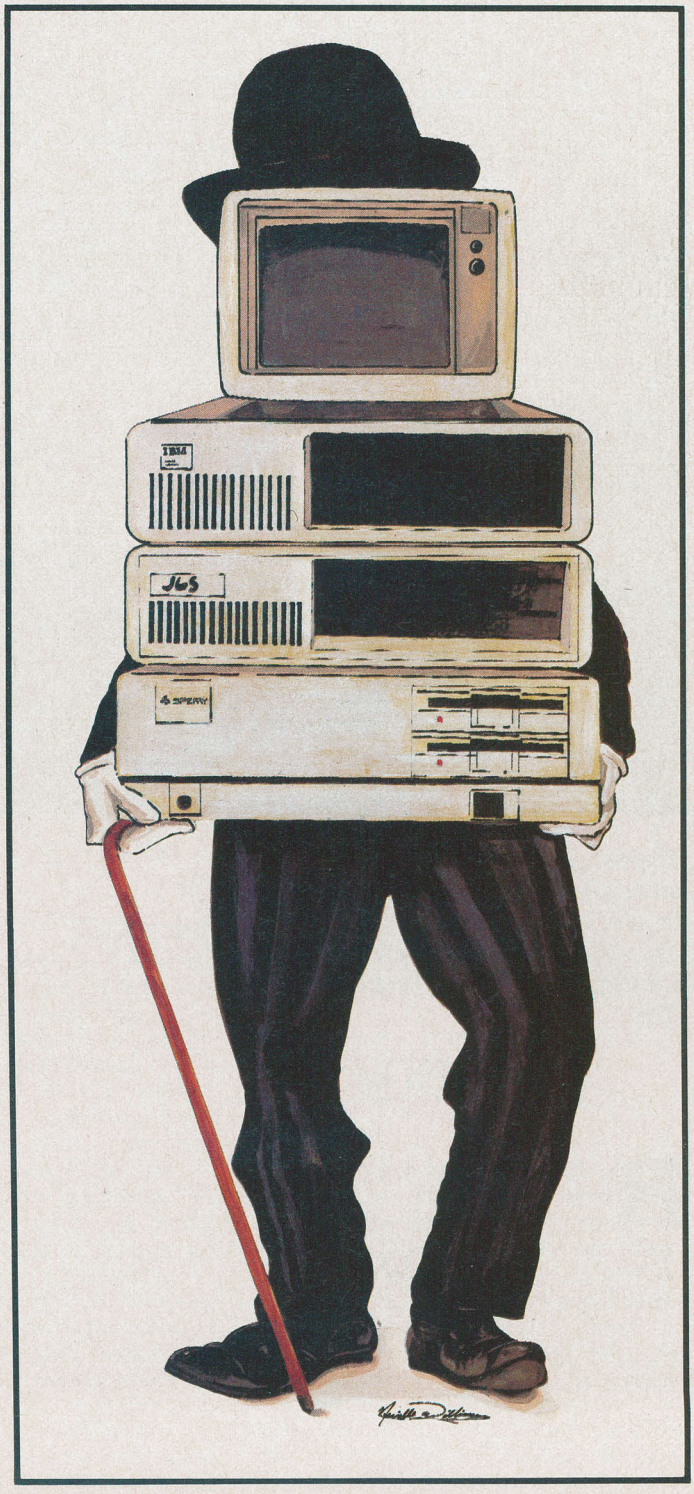
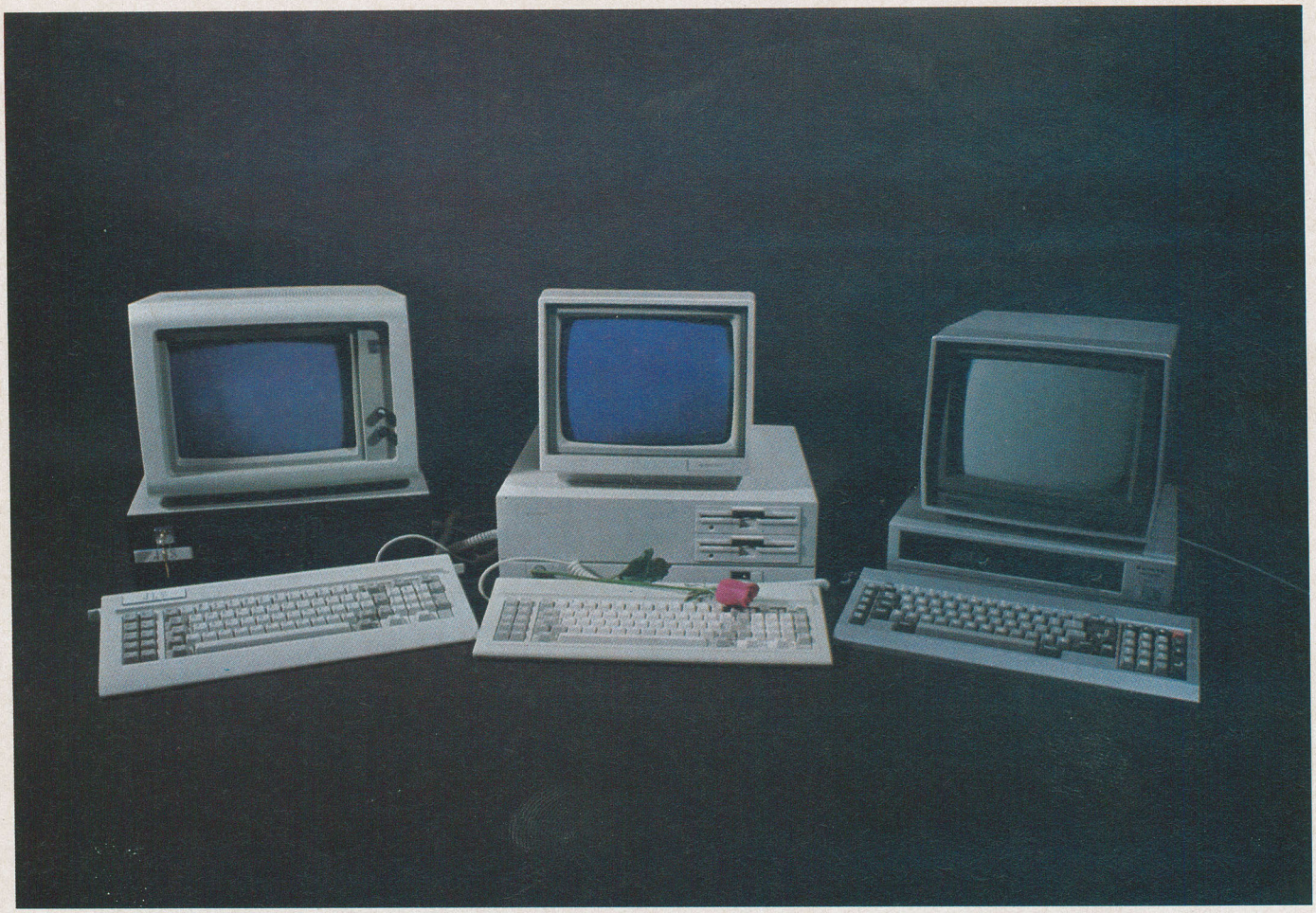


PC NOW!

Fables of Three Blue Clones



There came from the West country three blue clones, and three blue clones were them. They came from lands afar and awide, but none came from IBM.

by Steve Rimmer

Humanity probably won't end with either a whimper or a roar... it'll be more of a plastic skittering sound as trillions upon trillions of IBM compatible systems avalanche down upon the unsuspecting heads of mankind.

The IBM compatible systems that have sprung up of late have been legion and it has been all but impossible to keep up with them. Some are simply cheaper than the real IBM PC is, but quite a number feature technical innovations which make them faster or more powerful than the genuine blue.

We're going to look at three of them here.

The JLS XT

The latest thing to emanate from the productive soldering iron of Toronto computer builder Joe Sutherland, the JLS XT was the most powerful of the three clones we looked at. It was also the most cost effective and the only one to be built in Canada. Just kinda makes you break out in beaver pelts, doesn't it...

The JLS XT is an emulation of the IBM XT... something you probably could have figured out even without this article. It features eight expansion slots rather than the traditional five, a quarter megabyte of RAM and all of the usual nether trolls that live in large, powerful 8088 based systems. It can support more peripherals than any of the other systems we've looked at. It has provisions for... and can be purchased with... an optional ten megabyte hard disk, making it a very powerful business system indeed.

The system is backed up by JLS Computers, which has been building computers for longer than about three quarters of the computer manufacturers in the world... almost a year now. JLS maintains a full repair facility however, for those who envision handing their systems on down to their descendants, the architecture of the machine is extremely faithful to that of the real PC and, as such, could easily be serviced anywhere.

Like the very earliest of Sutherland's computers... the now almost mythical JLS Big Board CP/M based system we looked at in the August 1983 edition of CN!... the JLS XT is a formidable machine. It's a serious piece of work... nothing flaps when you move it and, like its predecessors, it's completely hand assembled and tested.

The JLS is the only low cost PC compatible system we've found that doesn't use a Taiwanese case. In most instances these systems are assembled in Canada but dropped into boxes that come from parts farther to the East. Such boxes are none too strong, and, dissatisfied both with their quality and the reliability of their delivery, Sutherland

has had a custom made steel cabinet built for the XT. It is available in a number of styles, in desk top and rack mounted manifestations and with flat and sculptured nose pieces. It's very much smaller than a PC style case, too... in fact, it's barely larger than the monitor that lives on top of it.

The case is a large part of what makes the JLS XT a particularly good desk ornament. Aside from being much more durable than that of most of the other systems one finds, it is laid out a bit differently. To begin with, the peripheral cards are parallel with the *back* of the box, rather than the sides. As such, one accesses the various connectors of the system through a hole in the right hand side of the cabinet.

This offers a number of advantages in using the computer. To begin with, it takes up less space front to back, as one needs no clearance for the cable connectors. This allows it to fit on a human sized desk typewriter leaf even if the desk is pushed up to the wall, something most systems aren't too comfortable with.

It also means that you don't have to levitate yourself over the computer every time you want to change connectors.

The case can also be equipped with a keylock. It looks a bit silly... you do feel a bit dumb as you start the computer up, your foot absently feeling around for the clutch... but it has positive benefits for business users who buy the machine with its optional hard disk. Because you can't remove a hard disk like you can a floppy, someone without the key will be unable to start the machine and play with sensitive software or data on the hard drive. It's fairly low level security, but it will frustrate many would be computer pirates.

Within

The system will run standard MS-DOS and CP/M-86, as well as all the other peculiar disk based things for the PC, like QNX seen elsewhere in this issue. It has two hundred and fifty-six kilobytes of RAM, which is, of course, expandable. One of the really fine things about having eight slots is that you can expand the system to your heart's content.

Because it emulates the PC's architecture fairly closely the JLS XT isn't likely to turn belly up and float under the auspices of some yet to be spewed forth software designed for the real IBM.

There are a number of small features which make the system a bit easier to use. The boot sequence, which tests the system memory when the computer is powered, prints the locations it's testing on the tube. It's pretty quick about it, too. The keyboard connector is on the side of the computer so you can pull the keyboard away from the computer to a decent length without running out of cable and hauling the machine off the desk. The additional slots allow one to associate a mouse or another printer with the XT and not be forever juggling plugs.

The XT comes complete with a large fan cooled power supply and a gnome that lives inside to adjust things. It can run for hours without cooking itself medium rare and, even when left on for several days ours didn't burp once.

There's an interesting story that Sutherland tells about the JLS IBM compati-

Fables of Three Blue Clones

ble systems. If you are up for checking these things out you may find that some of the far Eastern PC clones that have washed up recently have innards that look very much like those of a JLS. There's actually a decent reason for this. The engineers who built them were a bit worried about cloning the IBM itself so they looked around for something else to copy. A Toronto area computer shop owner brought them one of the first JLS systems.

This was profoundly distressing to Sutherland for at least a week... until he actually managed to see one of the imports. While they do look like their locally built parents, they have been cheapened up considerably. However, more to the point, by the time they're landed and shuffled through customs they have higher dealer prices that JLS machines with the same internal wizzbangs cost on the street.

JLS computers continues to sell all the machines it can produce. Despite the demand, Sutherland has maintained fairly constant prices on his hardware. The JLS XT starts at under three grand. It's available through a number of dealers or through JLS Computers Limited. Their address languishes in the bold type at the end of this feature.

The Sperry Personal Computer

Unlike many of the IBM compatible systems we've been privileged to look at of late... oh no, Billy, not another one... the Sperry doesn't look like an IBM. It looks like a shoe box, actually, having absolutely nothing sloping, curving or being anything other than straight up and down. There's nothing really wrong with this... few of the PC style systems have much to say about aesthetics.

The system is actually built by Mishubishi in Japan and branded for Sperry. It's nicely put together and some aspects of it are really superlative. While it holds no amazingly new technological surprises, it also seems to have few trolls lurking under the circuit boards to leap out at you unexpectedly.

Historically, Sperry has been doing computers for almost as long as the nasty things have been extant upon the planet, starting with the Univac system in the late forties. Of course, those computers couldn't run MS-DOS, even version one, and their graphics were pitiful.

While it is styled differently, the Sperry's hardware emulates that of the IBM pretty closely. It has one somewhat innovative feature, this being the availability of a higher clock frequency. The IBM's 8088 processor runs at just under five megahertz which, while fast by eight bit standards does not make it a particularly snappy machine due to the complexity of its operating system. A lot of that speed is soaked up in everything being so dense and complicated in there.

The Sperry has a switch out back which permits the processor to be run at the normal IBM clock speed or a higher one, which clips along at about seven megahertz. This does make a noticeable difference in some sorts of applications... my lazy ol' Wordstar package is a bit quicker at seven. However, it doesn't make as much difference as it looks like it should because of the way the system operates. The apparent speed increase is about one and a quarter times.

The Sperry we got had a monochrome only display board. Now this, combined with the monitor that came with the thing, was a perfect slice. If you want to use a PC type system for text related matters you can do no better than this computer. The screen was crisp and easy to look at, far more so than the IBM itself. However, as with all things, there is a catch.

The splendid monochrome display of the Sperry lacks enough memory to do graphics. All of the system's screens default to screen zero, the text only mode, and the graphics functions of BASIC all return error messages.

This is not to say that the system can't support graphics. As we'll get to, it has pots of options and you can choose a graphics card if you want one. It costs more, though.

Blue Genes

We tried most of the traditional software on the system with acceptable results. The ones, like WordStar and SuperCalc, which did a lot of screen updating were a bit faster and, of course, the splendid screen quality made them a lot more readable. Not having a graphics card we couldn't really try out the system's capability to draw pictures.

The computer we got came with two double sided double density drives and a hundred and twenty-eight K of RAM. This is fairly useable for most applications... a few things, like my pet AutoCAD program and QNX freaked out and complained about the memory restrictions. However, these are fairly specialized and expensive enough to warrant buying more RAM if you want to use them.

The system came with a Keytronics keyboard, easily one of the most atrocious keyboards ever made by human beings short of that of the ZX-81. However, most of the lower cost systems use these things now... for want of anything better I have one at home too. If you work at it you can get used to one in time.

The Sperry is a decent machine. You may find it a bit expensive in comparison with some of the other PC compatibles available now. It's not that much cheaper than a real IBM. However, it is a very nice computer to use and it comes in lots of permutations.

The permutations are a bit confusing, though, and if you're thinking of buying one your ultimate aura will be bluer if you scrutinize the lot. Essentially, you can have anything from a basic system with one drive, a dab of RAM and no frills... for just under four grand... right on up to a system with a hard disk and a colour card for just

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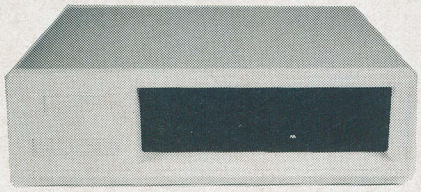

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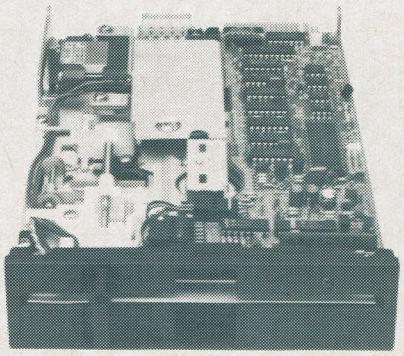

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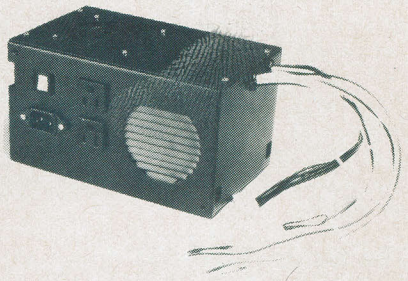

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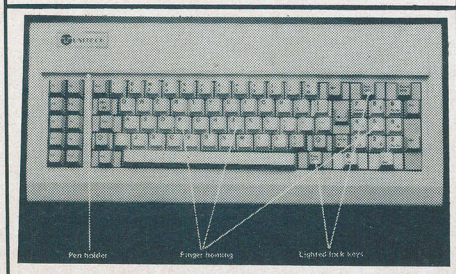

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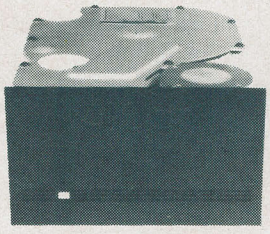

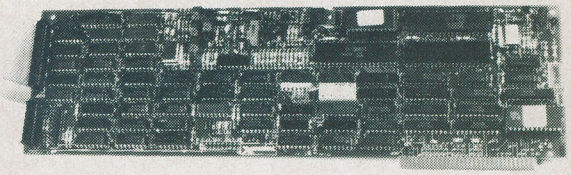

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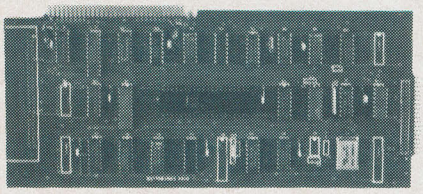

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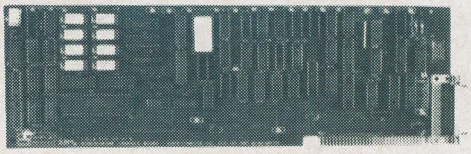

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Fables of Three Blue Clones

over nine and a half. You can also plug in a number of optional extras, such as memory expansion, extra drives, communications facilities and so on.

The list is long and tedious.

The Univac is, of course, no longer readily available, which is a drag. Sure, it took up a warehouse and used kilowatts of power to add two numbers together. It did, in fact, blow a lot of tubes and it was notoriously unreliable. It played a lousy game of Pacman. However, it was funky. The Sperry PC lacks all hope of ever being funky.

You'll probably appreciate this when you're using it, but it's a great cultural loss nonetheless.

The Sanyo MPC 555

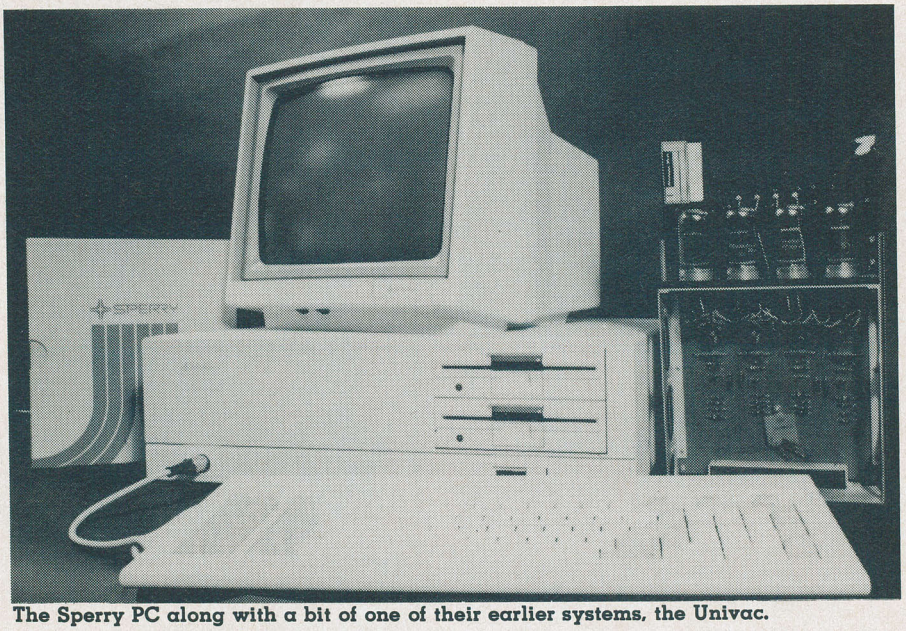
The Sanyo system has the distinction of being the least expensive 8088 based computer we've gotten to look at so far. The model we were given to play with goes for about two thousand dollars but there's a stripped down machine for around sixteen hundred. It doesn't look at all like a PC and, in many respects it doesn't act exactly like one either. However, it does have a number of interesting features.

The Sanyo is, to begin with, more of an IBM PCjr than a PC. It has everything hard wired onto a single circuit board with no expansion slots. This includes, in the case of the machine we got, a hundred and twenty-eight K of RAM and a colour graphics interface. There's a parallel printer port and an RGB output. There's no serial port in the off the shelf machine but one can be added... there's a hole out back to accept the connector.

The system comes with two single sided disk drives... you get about a hundred and sixty K on each, as opposed to about twice that amount on the drives in PC compatibles. It runs a version of MS-DOS 1.2 and it's unhappy with anything but its own manifestation of the operating system. In fact, not only will it not boot of the shelf MS-DOS... it also will not read disks formatted with it. Any software one runs on it must be provided in its format.

This would appear to be a single sided version of the normally double sided disk format, as you can read the directory tracks of other version 1.2 disks... these are located on the A side of the disk. While some software houses will provide software in this format it's by no means a universal practice.

To be fair, though, the system is not short of applications packages. Ours came with WordStar, SpellStar, MailMerge, CalcStar and InfoStar. Should you be unfamiliar with all these stars, this provides the Sanyo with the capabilities of doing word processing with a spelling checker and mailing list facility... the same software used to write these very words... a speadsheet that the publisher here doesn't think much of and a database manager that one of our freelance writers is enraptured with. You also get a custom BASIC which does high resolution graphics. We'll touch on this later.



The Sperry PC along with a bit of one of their earlier systems, the Univac.

In enumerating the aggregate files it's also fair to point out that the system disk lacks many of the utilities which are usually found on such things. Among the etherial souls are the assembler and linker needed to write in 8088 machine code. While you may not need 'em just now you will miss 'em if you get into writing complex programs.

The Sanyo is not a bad little beast to work at. The keyboard is heavier of touch than the Keytronics things that one normally gets with PC compatibles, and, I think, nicer to use. However, keyboards are very subjective.

The keyboard layout is very much unlike that of the real PC. In fact, it resembles that of some of the fancier Apple clones that have cropped up of late. It has a numeric keypad but only five function keys... you have to shift these to get the full ten functions available on the IBM.

The system's reset function, usually activated by hitting the control, alternate and delete keys simultaneously, is a button on the side of the keyboard in this case. The board also features a dedicated break key. Things are clearly labeled and will probably make better sense to a novice than would the cryptic runes of IBM.

The software provided with the Sanyo runs well. WordStar has a number of innovations attached to it, including ten pre-programmed operations activated by the function keys. Capsules of these are provided at the bottom of the screen as you type. This is a neat idea, except that I could find no way to change the assignments and there was also no apparent way to get rid of the line of descriptions if you didn't fancy looking at it.

CalcStar was a bit of a disappointment. It does everything it's supposed to do but it only avails one of little more than twenty K of memory... not a lot more than eight bit spreadsheets can manage running in sixty-four K machines.

Finally, the BASIC appears to be a non-Microsoft thingy... it supports most of the syntax of BASICA but there are variations and they'll do in your head if you're used to Microsoft's language... or are inexperienced and are trying to make a program copied from a magazine work, for instance.

The BASIC supports the graphics capabilities of the system fairly well. It can draw lines and circles and do fills. There's a screen editor in there which, while not so effortless in use as is the Microsoft version is fairly decent. The language seems to lack the sound and communications facilities of BASICA. While we couldn't try real BASICA on the computer because of the disk compatibility hassles it seems unlikely that it would work.

Other profound nuances of the BASIC are single keystroke BASIC command entry... a nice touch... and graphic characters

The Sanyo has a Selectric type Keyboard.

Table 1

All of the Sperries have a keyboard, a real time clock, one hundred and twenty-eight K of RAM, one Centronics type printer port, an RS-232C serial port, five expansion slots, MS-DOS 1.25, GWBASIC and diagnostic disks. The additional bells and whistles are listed below. All the floppies are three hundred and twenty K double sided drives. Standard colour is 640 by 200 pixels. High resolution colour is 640 by 400 pixels.

	Floppies	Hard Disk	Display	Price
Model 10	1	0	Monochrome	$3970
Model 20	2	0	Monochrome	$4690
Model 25	2	0	Standard Colour	$5780
Model 30	2	0	High Res Colour	$6790
Model 40	1	10 Mb.	Monochrome	$7760
Model 45	1	10 Mb.	Standard Colour	$8560
Model 50	1	10 Mb.	High Res Colour	$9570

The new JLS board was, in fact, designed by Joe Sutherland for Aftek Business Machines Incorporated, and can be found in either the JLS XT from JLS Computers Incorporated, 67 Mowat Avenue, Suite 343, Toronto, Ontario M6K 3E3, 1-416-530-4548 or in the Aftek PC.

Aftek is located at 762 Gordon Baker Road, Willowdale, Ontario M2H 3B4, 1-416-497-0531.

We borrowed the Sperry system we reviewed from The Computer Centre, 490 Yonge Street, Toronto, Ontario M4Y 1X5 1 (416) 966-5151

More information and the location of your nearest Sanyo dealer is available from Sanyo Canada Incorporated, 50 Beth Nealson Drive, Toronto, Ontario M4H 1M6 1 (416) 421-8344.

CN!

which can be entered directly from the keyboard, rather than with incessant use of the CHR$ function. This works in much the same way as does the Commodore 64 and makes for very easy block graphics drawing.

The BASIC is accompanied by a concise and fairly readable manual. However, it lacks an index which will wreak havoc on your brain as you get into it.

One Shot

The Sanyo is a fairly good system for what it costs. It's comfortable to use, is attractive... especially if you like stereos... has a better than average keyboard and comes with lots of useful software. The best thing about it, however, is that it's ruthlessly cheap.

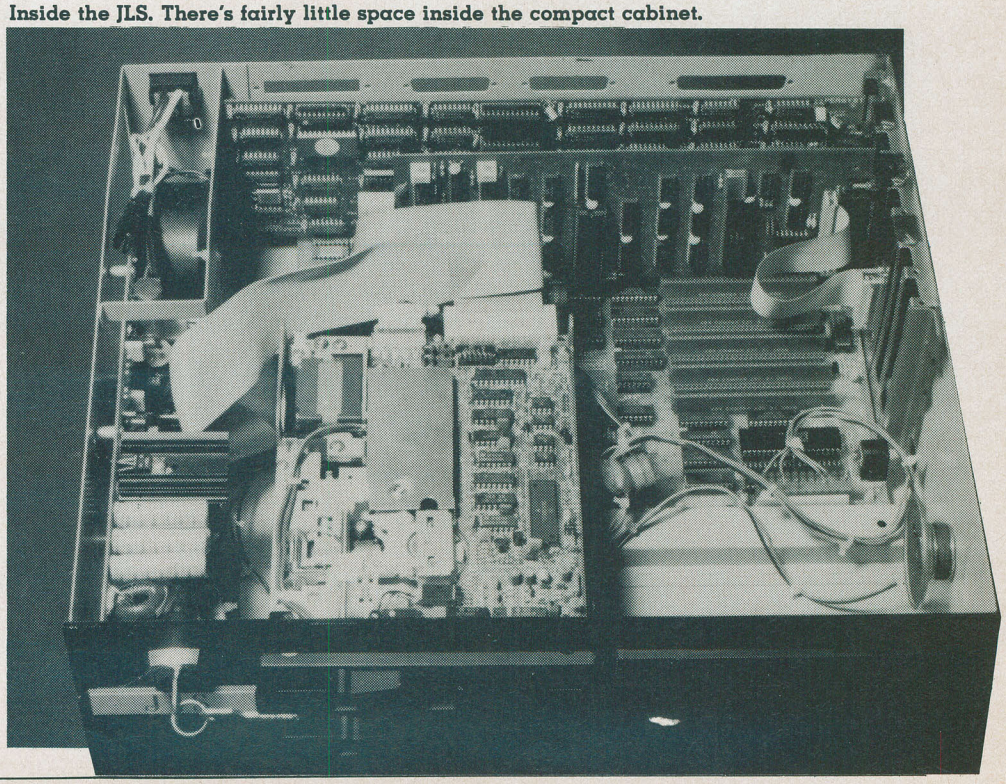
It's important that one recognize the machine's limitations, however. It is very much an appliance... aside from expanding its nominal hundred and twenty-eight K of RAM up to a full house quarter of a megabyte it is complete, and unchangable, as it sits. It has no expansion slots or other devices to permit adding more toys to it, so most of the new wrinkles which will be springing up for PC related systems will be inaccessable to it.

At the same time, software will also be a bit limited in that it will have to be provided in the Sanyo's single sided format. Chances are that you'd have to rely on the distributor to effect these format changes, and, as such, it may be difficult to get unusual packages for the system.

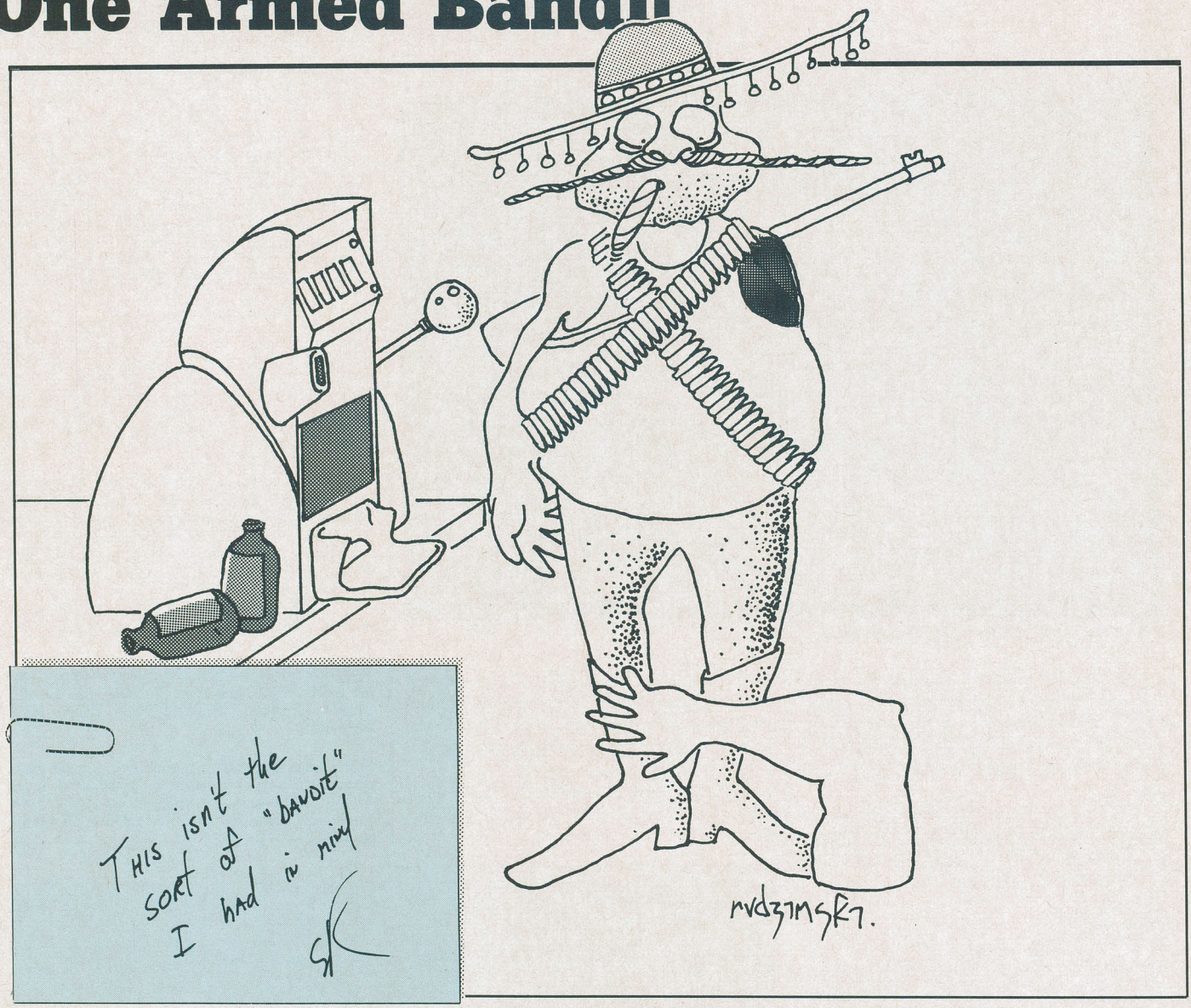
The Sanyo isn't a bad choice if you want to do what it's capable of. However, it is not a completely PC compatible machine. Its expansion and range of applications are both considerably less varied than those of a fully PC compatible computer.

It's only a good deal if you know what you're getting and know you don't need any more.

Inside the JLS. There's fairly little space inside the compact cabinet.



One Armed Bandit



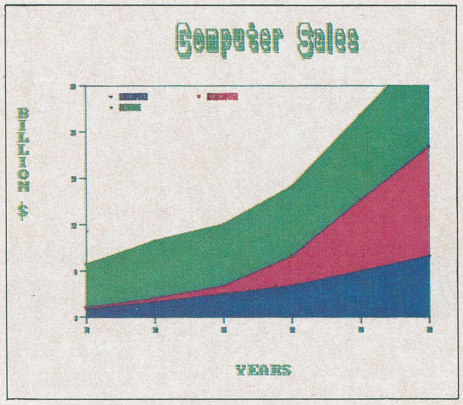
Slot machines are less commonly found in the home than say, refrigerators, which they look so much unlike. Much of this is because they are considered less useful by many people and don't have lights that come on when you open them. To prove this long standing myth wrong, we herewith present a slot machine program.

by Steve Rimmer

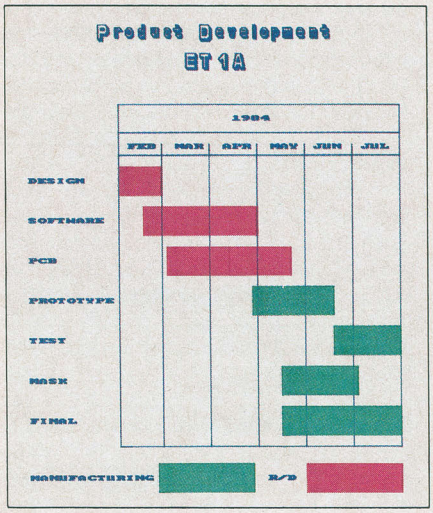
After you've put Lotus to bed, slid the code books back under the cat to keep 'em warm and turned off the telecommunications interfaces, you will probably be thinking about switching your computer off. This is a drag because just like the ads say, there's so much more you can do with it. An IBM compatible system can be a paper weight, a frog crusher, something to put the kids on at the table when there are no phone books handy, a gambling machine, a syner-galactic time warp manipulator...

WHEN SPREADSHEETS DON'T GIVE YOU THE PICTURE...

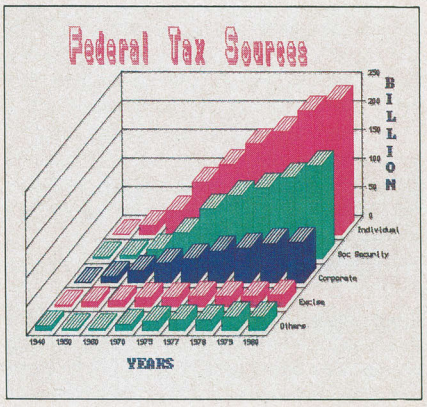
LINE CHARTS
STATISTICS



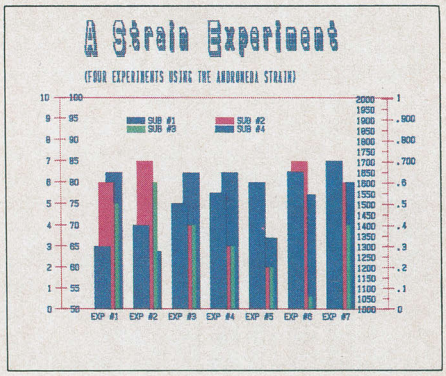
GANTT CHARTS
PROJECT SCHEDULING



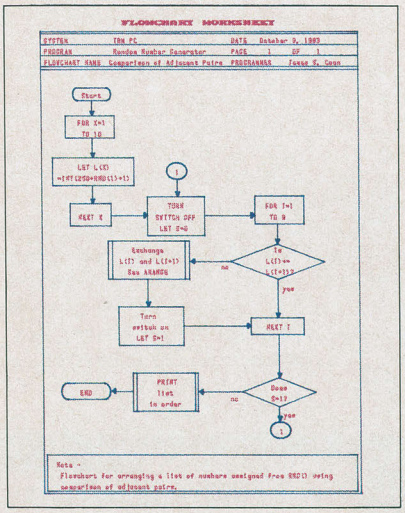
3-DIMENSIONAL
BAR CHARTS



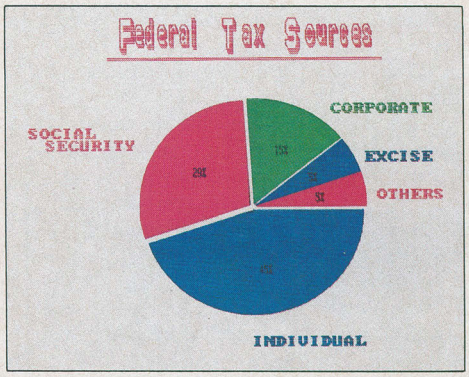
MULTI-SCALE BAR CHARTS
NEGATIVE BAR CHARTS



FLOW CHARTS
ORGANIZATION CHARTS



PIE CHARTS



* HARDWARE CONFIGURATION: IBM-PC; 128K; Dual Disk Drive; Graphics Adapter; Dot Matrix Printer; and/or XY Plotter; Compaq, Columbia and Eagle Computers.

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One Armed Bandit

Wait, yes, a gambling machine. Every PC owner needs a one armed bandit but few can afford one because they've spent all their clams on the PC. Well, the next best thing is a gambling program which will let your blue beastie think it's a casino troll. It's not quite so realistic as actually pouring silver dollars into a genuine coin muncher, but it's a lot cheaper. If the machine starts to win too much you can reset it.

The bandit program presented here is a simulation of a slot machine. I've never been to Las Vegas... the model for this one actually resides in a bar in Wales. It's probably unauthentic as they come, but it's fun to watch and suitably weird. BASIC programs can aspire to no higher stature.

Jackpot

This program simulates the action of the four spinning wheels of a slot machine. Each wheel contains combinations of six tokens, with ten tokens to the wheel. The tokens are cherries, lemons, grapes, melons, bells and fools; the fools being wild.

Wild fools are very common in Canada.

The program gives you ten dollars to start with and pays off on combinations of two or more tokens. It will pay on all combinations of three or four and on some pairs. If you get a non-paying permutation, it will scarf four bucks from you.

All the graphics and black magic involved in one of these things aside, the payoff schedule for a bandit is trickier than it may seem. Obviously it can't win most of the time... or at least it can't appear to. It also can't keep losing its shirt, although it must appear to lose quite often to be interesting. In the case of a real machine, it must pay out slightly less than it takes in... this one works the opposite way actually, as it's supposed to be amusing as opposed to profitable. However, if you look at the winnings starting in line 1470 you'll be able to change this should you feel larcenous.

There are a number of ways to achieve a desirable payoff methodology... the real machines do it by attaching odds to the tokens... the ones that pay more have proportionately less chance of occurring. However, there is an easier way, which is to have the machine pay out less than it wins most of the time. The balance, of course, is tricky, because if over a number of plays it starts to blast out a lot of jackpots, things will start looking very unrealistic indeed.

PUTting Green

There are a number of very nice things about the graphics available on the PC running BASICA... and a few that are real turkeys. The software can do all sorts of lively high and medium resolution image things, including drawing circles and doing fills. It also has a much more obscure function which allows very rapid movement of data between the screen RAM buffer and memory. We'll get to this in a moment.

The drawbacks involved are in the highly restrictive use of colour in the system. The hardware, which does the colour video display, is actually about as high tech as a gnu's doorknocker, working in much the same way as that of the grossly primitive Apple][+. It poses some serious restrictions.

The IBM can display graphics in essentially one of two modes. High resolution mode, or screen two, offers the system's maximum resolution of six hundred and forty pixels across... but only in two colours. Each pixel corresponds to one bit in the video buffer so it can either be on or off. The medium resolution mode offers half this number of pixels across, but allows you to graph in eight colours. Well that's not entirely true... there are eight colours available, but you can only use four at a time. You get to choose between two *palettes*, and having done so, all subsequent plotting must be done with colours which are associated with the one you've selected.

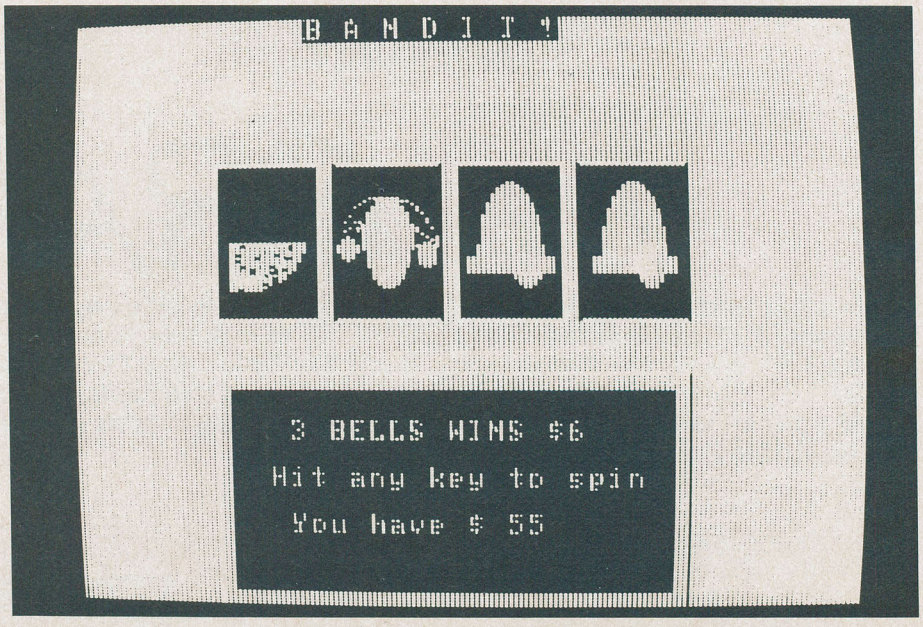
The colours in palette zero, which is the one chosen for the Bandit, are green, yellow, red and the screen background, which is black in this case. The other palette offers purple and a few other freaky tones... all in all, something to avoid unless you like negatives.

The tokens which flash by through the little windows in the slot machine are placed there using the BASIC's PUT statement. This is a handy little workie originally confined to disk I/O. Now it can transfer an array to the screen in a very short period of time... small images like these, look like they are being popped up instantaneously. The corresponding GET statement can suck screen information, colour and all, into an array equally as quick.

The introduction to BANDIT looks unnecessarily complex. It brings up a black page and draws each of the tokens on it. While this may look like decoration, it isn't... it allows us to use the convenient drawing commands of BASIC to put the pictures on the screen so that they can be GETted into arrays. Thereafter they can be plunked down considerably faster.

The only other programming peculiarity in this thing, is the use of the F1 function key. Normally when you end a program like this, you wind up with the screen a bizarre colour and set in the forty column mode. While not hard to restore, it's much nicer to do it under program control.

It's possible to set up BASICA so as to treat the function keys as software interrupts. The statements in line 160 tell the computer to check the status of the F1 key each time a new line is executed. If it discovers that the key is down, it will branch to the indicated line... four hundred in this case. The routine at four hundred cleans up the tube. The advantage in this, is that the program can be interrupted anywhere in its operation and still come to an orderly stop.



Three Lemons

This program does a decent one armed bandit, and is a good example of how to use the PUT and GET graphics of BASICA. While it lacks the excitement of a casino, it allows you to win vast amounts of money without corrupting your lifestyle or making you pay a lot of taxes.

Wealth has it's price, oh yes... it takes oceans more time to polish a Rolls than it does to wash one of those little Chevy roller skates. Be grateful that all of yours goes in disks.

```
10 '''''''''''''''''''''''''''''''''''''''''
20 ' BANDIT!                                '
30 ' A Gambling Machine Simulator           '
40 ' For the IBM PC (Written on JLS)        '
50 ' Copyright 1984 (c) Steve Rimmer        '
60 '                                        '
70 '''''''''''''''''''''''''''''''''''''''''
80 '
90 '    **** DEFINES ****
100 CR$ = CHR$(13)
110 CASH = 10
120 BS$ = CHR$(8)
130 WIN$ = ""
140 DIM CHERRY%(504),LEMON%(504),
     GRAPE%(504),MELON%(504 ),
     BELL%(504),FOOL%(504)
150 '    **** RUNNING CODE ****
160 KEY (1) ON  : ON KEY (1) GOSUB 400
170 SCREEN 1,0
180 COLOR 0,0
190 LOCATE 10,15,0
200 PRINT "B A N D I T !"
210 PRINT : PRINT "       Copyright (c) 1984 S.
     Rimmer"
220 LINE (30,65 ) - (295,100),1,B
230 GOSUB 460 'DRAW TOKENS
240 COLOR 0,0 : LOCATE 18,10,0 : PRINT "Hit any
     key to begin" : GOSUB 1010 : C$ =
     INPUT$(1)
250 ' PLAY THE GAME
260 CLS
270 FOR Y=1 TO 4
280 BX(Y) = ((Y*9) + (Y*40) + 10) : CX(Y) =
     ((Y*9) + (Y*40) + 52)
290 LINE (BX(Y),49) - (CX(Y),101),1,B : GOSUB
     1010
300 NEXT Y
310 PAINT (0,0),2,1
320 GOSUB 1080  : LOCATE 1,13,0 : PRINT "B A N
     D I T !"
330 GOSUB 1330  : LOCATE 22,12,0 : PRINT "You
     have $" CASH : LOCATE 18,12,0 : PRINT WIN$
340 LOCATE 20,11,0, : PRINT "Hit any key to
     spin"
350 C$ = INKEY$
360 SEED = SEED + 1 : IF SEED  32767  THEN
     SEED = 0
370 IF C$ = "" THEN 350
380 RANDOMIZE VAL(RIGHT$(TIME$,2))
390 GOSUB 1330 : GOSUB 1270 : GOSUB 1370 : GOTC
     330
400 'SAY GOODBYE AND BE GONE
410 WIDTH 80
420 LOCATE 10,30,0
430 PRINT "Thanks for the game!"
440 END
450 ' *** SUBMARINES ***
460 'draw cherries
470 CIRCLE (50,25),40,1,2.5,3
480 CIRCLE (60,5),35,1,2.5,3.5
490 CIRCLE (70,25),55,1,2.5,3.5
500 CIRCLE (20,40),7,6,,,1 : PAINT (20,40),6,6
510 CIRCLE (10,25),7,6,,,1 : PAINT (10,25),6,6
520 CIRCLE (28,21),7,6,,,1 : PAINT (28,21),6,6
530 GET (0,0) - (40,50),CHERRY%  ' :LINE (0,0)
     - (40,50),1,B
540 'draw lemon
550 CIRCLE (70,25),12,3,,,1 : PAINT (70,25),3,3
560 CIRCLE (60,25),8 ,3,,,.75 : PAINT
     (55,25),3,3
570 CIRCLE (80,25),8 ,3,,,.75 : PAINT
     (85,25),3,3
580 FOR X=1 TO 30
590 PSET ((60+(RND*20)) ,(25+(RND*12))),0
600 NEXT X
610 GET (50,0) - (90,50),LEMON% ':LINE (50,0) -
     (90,50),1,B
620 'draw grapes (green ones)
630 FOR X=120 TO 150 STEP 8
640 CIRCLE (X,15),4,1,,,1 : PAINT (X,15),1,1 :
     CIRCLE (X,15),2,3,3.7,5.75,1
650 NEXT X
660 FOR X=124 TO 140 STEP 8
670 CIRCLE (X,22),4,1,,,1 : PAINT (X,22),1,1 :
     CIRCLE (X,22),2,3,3.7,5.75,1
```

One Armed Bandit

```
680 NEXT X
690 FOR X=128 TO 136 STEP 8
700 CIRCLE (X,29),4,1,,,1 : PAINT (X,29),1,1 :
    CIRCLE (X,29),2,3,3.7,5.75,1
710 NEXT X
720 CIRCLE (132,36),4,1,,,1 : PAINT
    (132,36),1,1 : CIRCLE
    (132,36),2,3,3.7,5.755,1
730 CIRCLE (142,10),10,1,.7,3
740 CIRCLE (142,0),10,1,3.7,5.75 : PAINT
    (142,5),3,1
750 GET (112,0) - (152,50),GRAPE% ':LINE
    (112,0) - (152,50),1,B
760 'draw melon
770 CIRCLE (190,25),25,1,4.5,0,.65
780 CIRCLE (190,25),20,1,4.5,0,.65
790 LINE (185,25) - (215,25),1
800 LINE (185,25) - (185,40),1
810 PAINT (186,26),2,1 : PAINT (214,26),1,1
820 FOR X=1 TO 30
830 PSET ((186+(RND*30)) ,(26+(RND*15))),0
840 NEXT X
850 GET (180,0) - (220,50),MELON% ':LINE
    (180,0) - (220,50),1,B
860 'draw bell fruit
870 CIRCLE (267,35),5,2,,,1 : PAINT
    (267,35),2,2
880 CIRCLE (260,30),25,3,0,3.25,2 : LINE
    (243,30) - (277,35),3,BF
890 PAINT (260,25),3,3
900 GET (240,0) - (280,50),BELL% ': LINE
    (240,0) - (280,50),1,B
910 'draw fool
920 LINE (137,161) - (163,161),3 : LINE
    (137,160) - (163,160),1
930 CIRCLE (146,170),20,2,1.5,2.7,1.25 : CIRCLE
    (150,172),22,2,1.5,2.7,.75
940 CIRCLE (150,160),20,3,3.25,0,2 : CIRCLE
    (150,170),20,1,.25,2.7,1.7
950 PAINT (150,159),1,1 : PAINT (150,162),3,3
960 CIRCLE (152,175),25,1,.25,1.7,1.25 : CIRCLE
    (152,185),27,1,.75,1.5,.95
970 CIRCLE (134,167),4,1,,,1 : PAINT
    (134,167),1,1
980 CIRCLE (166,169),4,2,,,1 : PAINT
    (166,169),2,2
990 GET (130,140) - (170,190),FOOL%  ': LINE
    (130,140) - (170,190),1,B
1000 RETURN
1010 'play music
1020 A$ = "MB MS O3 T255 L16"
1030 FOR X=0 TO 25*RND + 6
1040 A$ = A$ + MID$("ABCDEFG",(INT(7*RND)+1),1)
     + " "
1050 NEXT X
1060 PLAY A$
1070 RETURN
1080 'SET UP PLAY WHEELS
1090 A = RND(-1*SEED)
1100 FOR X=1 TO 4
1110 FOR Y=0 TO 9
1120 WHEEL(X,Y) = INT(RND*6)+1
1130 NEXT Y : NEXT X
1140 RETURN
1150 'SPIN ONE WHEEL
1160 FOR X=1 TO RND*10+5
1170 Y = INT(RND*9)
1180 TOKEN(C) = WHEEL(C,Y)
1190 IF TOKEN(C) = 1 THEN PUT
     (BX(C)+1,50),CHERRY%,PSET
1200 IF TOKEN(C) = 2 THEN PUT
     (BX(C)+1,50),LEMON%,PSET
1210 IF TOKEN(C) = 3 THEN PUT
     (BX(C)+1,50),GRAPE%,PSET
1220 IF TOKEN(C) = 4 THEN PUT
     (BX(C)+1,50),MELON%,PSET
1230 IF TOKEN(C) = 5 THEN PUT
     (BX(C)+1,50),BELL%,PSET
1240 IF TOKEN(C) = 6 THEN PUT
     (BX(C)+1,50),FOOL%,PSET
1250 NEXT X
1260 RETURN
1270 'SPIN ALL FOUR WHEELS
1280 FOR C=1 TO 4
1290 GOSUB 1010
1300 GOSUB 1150
1310 NEXT C
1320 RETURN
1330 ' CLEAN UP TEXT BOX
1340 LINE (BX(1),120) - (BX(4)+42,200),3,BF
1350 LINE (BX(1)+6,120+6) - (BX(4)+36,194),0,BF
1360 RETURN
1370 'FIGURE SCORE
1380 FOR X=1 TO 6 : PAY(X) = 0 : NEXT X
1390 FOR X = 1 TO 6
1400 FOR Y = 1 TO 4
1410 IF TOKEN(Y) = X THEN PAY(X) = PAY(X) + 1
1420 NEXT Y : NEXT X
1430 FOR X = 1 TO 5
1440 PAY(X) = PAY(X) + PAY(6)
1450 NEXT X
1460 'FIGURE WINNINGS
1470 WIN = -4 : WIN$ = "LOOSE $4"
1480 IF PAY(1) = 2 THEN WIN = 1 : WIN$ = "2
     CHERRIES WINS $1"
1490 IF PAY(1) = 3 THEN WIN = 2 : WIN$ = "3
     CHERRIES WINS $2"
1500 IF PAY(1) = 4 THEN WIN = 6 : WIN$ = "4
     CHERRIES WINS $6"
1510 IF PAY(2) = 2 THEN WIN = 1 : WIN$ = "2
     LEMONS WINS $1"
1520 IF PAY(2) = 3 THEN WIN = 3 : WIN$ = "3
     LEMONS WINS $3"
1530 IF PAY(2) = 4 THEN WIN = 7 : WIN$ = "4
     LEMONS WINS $7"
1540 IF PAY(3) = 2 THEN WIN = 1 : WIN$ = "2
     GRAPES WINS $1"
1550 IF PAY(3) = 3 THEN WIN = 2 : WIN$ = "3
     GRAPES WINS $2"
1560 IF PAY(3) = 4 THEN WIN = 8 : WIN$ = "4
     GRAPES WINS $8"
1570 IF PAY(4) = 3 THEN WIN = 2 : WIN$ = "3
     MELLONS WINS $2"
1580 IF PAY(4) = 4 THEN WIN = 4 : WIN$ = "4
     MELONS WINS $4"
1590 IF PAY(5) = 3 THEN WIN = 6 : WIN$ = "3
     BELLS WINS $6"
1600 IF PAY(5) = 4 THEN WIN = 9 : WIN$ = "4
     BELLS WINS $9"
1610 IF PAY(6) = 2 THEN WIN = 6 : WIN$ = "2
     FOOLS WINS $6"
1620 IF PAY(6) = 3 THEN WIN = 10 : WIN$ = "3
     FOOLS PAYS $10"
1630 IF PAY(6) = 4 THEN WIN = 50 : WIN$ = "4
     FOOLS WINS $50"
1640 CASH = CASH + WIN
1650 RETURN
```

CN!

Almost Free Software Volume II

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The second volume of our seethingly popular Almost Free Software is now ready. We've trolled the corners of the world in a number of higher order dimensions for this code. Whether you are interested in business applications, games, programming or just playing with your computer, you'll want volume two for your shelf. (Volume one is still available and may be ordered at the address below:)

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BISHOW The ultimate file typer, BISHOW version 3.1 will type squeezed or unsqueezed files and allow you to type files which are in libraries (see LU, below). However, it also pages in both directions, so if you miss something, you can back up and see it again.

LU Every CP/M file takes up unnecessary overhead. If you want to store lots of data in a small space, you'll want LU, the library utility. It permits any number of individual files to be stored in one big file and cracked apart again.

MORTGAGE This is a very fancy mortgage amortization program which will produce a variety of amortization tables.

NSBASIC Large disk BASIC packages, such as MBASIC, are great . . . and very expensive. This one, however, is free . . . and every bit as powerful as many commercial programs. It's compatible with North Star BASIC, so you'll have no problem finding a manual for it.

Z80ASM This is a complete assembler package which uses true Zilog Z80 mnemonics. It has a rich vocabulary of pseudo-ops and will allow you to use the full power of your Z80 based machine . . . much of which can't be handled by ASM or MAC.

VFILE Easily the ultimate disk utility, VFILE shows you a full screen presentation of what's on your disk and allows you to mass move and delete files using a two dimensional cursor. It has heaps of features, a built-in help file and works extremely fast.

ROMAN This is a silly little program which figures out Roman numerals for you. However, silly programs are so much fun . . .

CATCHUM If you like the fast pace and incredible realism of Pacman, you'll go quietly insane over Catchum . . . which plays basically the same game using ASCII characters. Watch little "C"'s gobble period while you try to avoid the deadly "As" . . . it's a scream.

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MS-DOS Survey

It seems that more and more systems are springing up that run MS-DOS. Here's a survey of what's presently available.

Scarcely a year ago, Apple][+ clones were the rage. Hardware hackers all over Canada raided their neighbourhood electronics parts stores to stuff motherboards that mysteriously appeared one night. On completion, silent prayers would be mumbled, a switch thrown, and with luck a control G would vibrate the speaker, an audio confirmation of a job well done.

Later, with cheap Taiwanese imports and brawling between rival suppliers, it became increasingly more profitable to purchase an assembled unit rather than take chances assembling it yourself, but around this time heads were being turned in a new direction... IBM compatibles.

There are three types of computers in this survey... IBM PCs, IBM PC compatibles and IBM PC clones. The difference between the last two is this; compatibles don't go out of their way to emulate the IBM product to the fullest possible extent, whereas clones do.

While most of the excitement has died down over the Apple clones, the latest offerings in computers that operate under MS-DOS indicates that the popularity of these micros is assured. While most of the units noted in this survey are completely assembled, many manufacturers... notably those of clones... give you the opportunity to assemble them yourself... just the thing to do when it's three in the morning and there's a lonesome 8088 microprocessor peering out from your parts box.

Name	Ram	Printer I/O	Disk Drives Included	Screen Format	Graphics	Sound	Colour	Software Included	Manufacturer	Available From	Suggested Retail	Other
Associate	128K	3 serial, 1EEE, optional parallel	DS DD 5¼" floppy or optional	80 x 25 or 13 x 25	graphics characters 256 user definable	Yes	Optional	Microplan, Spellbinder, acc pak	Associate	Datacalc Technology Ind Corp	$4495.00	114 function keys
B.E.S.T.	64K	Serial and parallel	One DD DS floppy	80 x 24	640 x 325 pixels	Yes	No	N/A	Multiflex	Exceltronix	$1995.00	IBM PC compatible
The Big Blue Board	128K expandable to 256K	Optional card floppy	One slimline 5¼"	80 x 24	640 x 200 pixels	Yes	Yes	N/A	Robin Hood Electronics	Robin Hood Electronics	$2495.00	IBM compatible
Canon AS-100	128K	Optional serial or parallel	Optional 5¼" or 8" floppy or 5" hard	80 x 25	640 x 400 pixels	No	Optional	2 BASICs	Canon	Office Equipment	$3525.00	Available with colour ink jet printer
Columbia PC	128K	Two serial, one parallel	Dual 5¼" floppy	40/80 x 25	640 x 200 pixels	Yes	Yes	MS-DOS, CP/M-86	Columbia Data Systems	Hamax Data Systems	N/A	IBM compatible, optional 10 mb hard disk
Copam PC-301	256K	One parallel, two serial	Two 5¼" floppy	40/80 x 25	640 x 200 pixels	Yes	Yes	MS-DOS, CP/M-86	Copam Canada	Universal Computer Systems	$3495.00	IBM compatible
Corona PC	128K	Serial and parallel	One SS DD 5¼" floppy	80 x 24	640 x 325 pixels	Yes	Optional	Multimate, two tutorials	Corona	Scarsdale Computers	$3888.00	Can mix text and graphics
DEC Rainbow 100	64K	Serial	Two 5¼" floppy	80/132 x 24	Optional 900 x 260 pixels	No	Optional	Choice of CP/M-86 or MS-DOS	Digital Equipment	Local Dealers	$4600.00	
HP 150 Touchscreen	256K	Two serial, one IEEE-488	Optional floppy or hard drive	80 x 24	512 x 390 pixels	No	No	MS-DOS, P.A.M.	Hewlett Packard	NSN Options	$4859.00	
Heath H-100	192K	2 serial and 1 parallel	1 DS DD 5¼" floppy	80 x 24	640 x 225 pixels	No	Optional	CP/M or ZDOS	Heathkit	Heathkit	$3300.00; $3500.00 with integrated monitor	Kit version of Zenith Z-100
NEC Advanced Personal Computer	128K	Serial and parallel	One or two 8" floppy	80 x 25	640 x 475 pixels display window	Yes	Optional	CP/M and MS-DOS	NEC	Microcomputers of Canada, Inc.	$4195.00 1 drive; $5195.00 drives	$6395.00 with colour
Pronto 16/10	128K	2 serial, 1 parallel 4 expansion ports	2 5¼" floppy	80 x 25	Optional 640 x 480 pixels	No	No	BASIC, word processor, spreadsheet, more	Pronto Computers, USA	Progeni Computer Consultants Ltd.	$5900.00	
TI Professional Computer	64K	Serial, 5 expansion ports	320K floppy	80 x 25	720 x 300 pixels	No	Optional	N/A	Texas Instruments	Lanpar	$4140.00	Voice management system available
Tomcat PCX 1600	128K	Serial and parallel	Two 5¼" DS DD floppy	80 x 25	Graphics characters in ROM	No	No	N/A	Tomcat	Tomcat Computers & local dealers	$3995.00	Some IBM compatibility

Tomcat PCX 1800	128K	Serial and parallel	Two 5¼" DS DD floppy	80 x 25	640 x 400 pixels	No	No	CP/M, CP/M-86 and MS-DOS	Tomcat	Tomcat Computers & local dealers	$4995.00	Some IBM compatibility
Tomcat 3000	128K	2 serial	8" floppy, 5¼" hard	80 x 25	640 x 400 pixels	No	Optional	MS-DOS, CP/M-80, CP/M-86	Tomcat	Tomcat Computers & local dealers	$16900.00	26 megabyte storage
IBM PC	64K	Expansion slots	One 160K 5¼" floppy	80 x 25	640 x 200 pixels	Yes	Optional	Operating systems	International Business Machines	Local dealers	$4800.00	Optional auxiliary storage with expansion unit
IBM XT	128K	Expansion slots	One 5¼" floppy, one 10 mb hard drive	80 x 25	640 x 200 pixels	Yes	Optional	Operating systems	International Business Machines	Local dealers	$8500.00	
TRS-80 2000	128K	Serial; 4 expansion slots	Two slimline 5¼" floppy	80 x 24	640 x 400 pixels	Yes	Yes	MS-DOS	Tandy	Radio Shack	$5899.00 1 drive; $6899.00 2 drives; $9399.00 hard drive	Processor operates at 8 MHz
TEO PC.XL	128K	Two serial and one parallel	Two DS DD 5¼" floppy	40/80 x 25	320/640 x 200 pixels	Yes	Yes	MS-DOS	TEO Computer	TEO Computer	$3495.00	IBM PC compatible
Toshiba T-300	192K; expandable to 512K	One serial, one parallel	One 5¼" DD floppy	80 x 25	640 x 500 pixels	Yes	Yes	MS-DOS and TBASIC	Toshiba	Irwin Electronics	$3395.00	Programmable function keys
Xerox 16/8 Prof. Comp.	128K	Serial and parallel	Optional 2 floppy or 1 hard, 1 floppy	80 x 24	Optional	No	No	BASIC	Xerox	Xerox Stores	$5595.00 SS drives; $6795.00 DS drives	$8995.00 with rigid disk
Zenith Z-100	128K	2 serial and 1 parallel	One DS DD 5¼" floppy	80 x 24	640 x 225 pixels	No	Optional	CP/M or ZDOS	Zenith	Local dealers	$4395.00 (no monitor); $5295.00 2 drives	$5450.00 with two drives and monitor
Ajile	256K	Serial and parallel	One 5¼" DS DD floppy	80 x 25	640 x 250 pixels	Programmable	No	In-Scribe, Multiplan	Bytec-Comterm	Anderson Jacobson	$4285.00	
Hyperion	256K	Serial and parallel	Two 5 1/4" DS DD	80x25	640x250 pixels	Programmable	No	In:Scribe, Multiplan	Bytec-Comterm	Computerland	$4950.00	
Columbia VP	128K	Serial, parallel and 7 expansion slots	Two-half 5¼" DS DD floppy	40/80 x 25	640 x 200 pixels	Yes	No	Perfect series, Fast Graphics	Columbia Data Systems	Peripherals Plus	$4495.00	
DOT Portable	128K	Two serial	Two 31/2" SS DD Floppy	80 x 25	1056 x 254 pixels	No	No	MS-DOS	Computer Devices	Datamex	N/A	Integrated printer
Corona Portable	128K	Serial and parallel; 4 expansion slots	One half-height 5¼" floppy	80 x 24	640 x 325 pixels	Yes	No	PC Tutor, GW BASIC, MultiMate	Corona	Scarsdale	$3888.00	
Kaypro II Plus 88	320K	Two serial, one parallel	Two 5¼" SS 160K floppy	80 x 24	No	No	No	Perfect Writer, Profit Plan	Kaypro	Local dealers	$2790.00	
Kaypro 4 Plus 88	320K	Two serial, one parallel	Two 5¼" DS DD 320K floppy	80 x 24	No	No	No	Perfect Writer, Profit Plan	Kaypro	Local dealers	$3690.00	
Olivetti Portable Personal Computer	128K	One serial and parallel	One or two half-height 5¼" DS DD floppy	80 x 25	640 x 325 pixels	Yes	No	PC Tutor, MultiMate, GW BASIC	Corona	Provincial Business Systems	One drive; $3995.00 Two drives $4495.00	Shock mounted disk drives

Name	Ram	Printer I/O	Disk Drives Included	Screen Format	Graphics	Sound	Colour	Software Included	Manufacturer	Available From	Suggested Retail	Other
Olivetti Personal Computer	128K	One serial and one parallel	One or two half-height 5¼" DS DD floppy	80 x 25	640 x 325 pixels	Yes	No	PC Tutor, Multimate, GW BASIC	Corona	Provincial Business Systems	One drive: $4095.00 Two drives: $4595.00	4 IBM compatible slots
Sharp PC 5000	128K	Serial	Optional 128K bubble cartridge	80 x 8 LCD	640 x 80 pixels	No	No	N/A	Sharp Electronics	Total Office Systems	$2695.00	
Texas Instruments Portable	64K minimum	Serial and parallel	One half-height 5¼" floppy	80 x 25	720 x 300 pixels	Yes	Optional	N/A	Texas Instruments	Texas Instruments	Base: $3760.00	
Olympia People	128K	Serial and parallel	Two floppy drives	80 x 25	600 x 485	No	Optional	Word Star, Super-Calc, dBASE II	Olympia International	Olympia Business Machines Canada Limited	$5450.00	
Sanyo MBC 550/555	128K	Optional serial	One 5" floppy (550) or two (550)	80 x 25	640 x 200 pixels	Yes	Yes	BASIC, MS-DOS	Sanyo	Local dealers	$1495.00	$1995.00 for 550 model with extra software package
Sanyo 4000/4050	128K	Serial and parallel	One 5¼" DS DD floppy (4000) or two (4050)	80 x 25	No	No	No	CP/M-86 and BASIC	Sanyo	Astris Science Inc.	$4595.00	(4000 model)
Sperry Personal Computer	128K	Serial	One or two 5¼" 320K floppy or 10 mb hard	40/80 x 25	320 x 200, 320 x 400 640 x 200 or 640 x 400 pixels	No	Optional	MS-DOS	Sperry Inc.	Sperry Inc.	$3970.00 base configuration	Seven configurations available
JLS PC	64K	One serial, one	One 360K 5¼" floppy	80 x 24	640 x 320 pixels	Yes	Yes	N/A	JLS Computers	JLS Computers	$2800.00	
IBM PCjr	64K	Serial	Optional DS 5¼" floppy	40 x 24	N/A	Yes	Yes	BASIC; DOS 2.1 (with enhanced model)	International Business Machines	Local Dealers	$1900.00	Compatible with 30 IBM PC programs
Victor 9000	128K	Two serial and two parallel	Two 5" floppy	80/132 x 25	800 x 400 pixels	No	Optional	Operating systems, BASIC	Victor	Compucollege Stores	$3995.00	
The President XT	128K	One serial or one parallel	Two half-height 5¼" floppy	40/80 x 24	640 x 320 pixels	Yes	Yes	N/A	President Computer Corp.	President Computer Corp. or local dealers	$2995.00	Swivel-based Hires monochrome
Panama XT	64K	One serial, one parallel	One half-height 5¼" floppy; optional hard drive	40/80 x 24	640 x 320 pixels	Yes	Optional	BIOS in ROM	Ogivar Inc.	Ogivar Inc., local dealers	$3000.00	Keyboard also has French characters 12 expansion slots
TAVA PC	64K	Two serial, one parallel	N/A	40/80 x 25	640 x 320 pixels	Yes	Yes	Operating systems	TAVA Corporation	Nielsen Computers Inc.	$3395.00	Includes IBM 3260 emulator
Eagle Plus	128K	Two serial, one parallel	One or two 5¼" floppy	40/80 x 25	640 x 200 pixels	Yes	Optional	Operating systems, EagleWriter, Eagle Calc	Eagle Computers	Local dealers	$3530.00 with one floppy $4100.00 with two	
Eagle Plus XL	Same as the Eagle Plus, but with 10 megabytes of integrated hard storage.										$6250.00	
Eagle Spirit	128K	Two serial, one parallel	One or two 5¼" floppy	40/80 x 25	640 x 200 pixels	Yes	Yes	Operating systems, EagleWriter, EagleCalc	Eagle Computers	Local dealers	$4820.00	Integrated 9" monitor
Eagle Spirit XL	Same as the Eagle Spirit, but includes integrated 10 megabyte hard drive.										$6965.00	

Durango Poppy	128K	One serial, one parallel	One 800K 5¼" floppy	80 x 25	N/A	No	N/A	MS-DOS	Durango Systems Inc.	Norango Computer Systems Inc.	$6995.00	14" monitor and station included
Chameleon I	128K	Serial and parallel	One DS 5¼" floppy	80 x 24	320/640 x 200 pixels	Yes	Yes	PerfectWriter/Calc, MS-DOS, MBASIC, GWBASIC, C Term	Seequa	Local dealers	$2995.00	9" monitor
Chameleon II	256K	Serial and parallel	Two DS DD 5¼" floppy	80 x 24	320/640 x 200 pixels	Yes	Yes	PerfectWriter/Calc/ Speller, MS-DOS, MBASIC, GWBASIC, C Term, Condor 1	Seequa	Local dealers	$3995.00	9" monitor
Chameleon XT	256K	Serial and parallel	One DS 5¼" floppy, one 10 mb hard drive	80 x 25	320/640 x 200 pixels	Yes	Yes	PerfectWriter/Calc/ Speller, MS-DOS, MBASIC, GWBASIC, C Term, Condor 1	Seequa	Local dealers	$5500.00	9" monitor
BEE PC	128K	One parallel and two serial	One 5¼" DS DD floppy	40/80 x 24	640 x 320 pixels	Yes	Yes	N/A	Bee Microsystems	Local dealers	$2995.00	10 programmable function keys
HAL	128K	One serial, one parallel	One Half-height 320K DS DD 5¼" floppy	80 x 25	640 x 320 pixels	Yes	Yes	N/A	HAL Computer Company	Hal Computer Company	$2499.00	Fully compatable with with IBM PC with PROM purchases
STM Personal Computer	256K	One parallel, two serial, one IBM compatible I/O bus connector	Two DS DD 5¼" floppy, 712K each	80 x 25 LCD	640 x 200/ 720 x 348 pixels	Yes	Yes	MS-DOS, telephone/modem support	Semi-Tech Micro-electronics Corp.	Local dealers	$4989.00	RGB/composite output, integrated modem/ printer/hands-free telephone
HS-151	128K (Expandable to 640K)	Two serial, one parallel	One or two 5¼" DS DD 360K floppy	80 x 25	640 x 200 pixels	Yes	Yes	MS-DOS, diagnostic software	Heath/Zenith	Heathkit Electronics Centre	One drive; $2799.00 kit/ $3999.00 assembled. Two drives: $3199.00 kit/$4659.00 assembled	IBM compatible slots
HS-161	128K	Two serial, one parallel	One or two5¼" 360K DS DD floppy	80 x 25	640 x 200 pixels	Yes	Yes	MS-DOS, diagnostic software	Heath/Zenith	Heathkit Electronics Centres	N/A	9" integrated amber monitor

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PC NOW!

Charlie Meets the Interrupts

Programming the IBM PC at the machine language level involves the use of ugly, scaly, moss encrusted interrupts. Terrible things, these, but if you take your sword in hand they might yet be defeated.

by Steve Rimmer

There are a number of things which make programming the IBM PC at the machine language level a bit like holding an orgy on a cactus farm. The twelve zillion instructions of the 8088 don't help, and, if you are used to programming under a less profound operating system, say, like CP/M, some of the conventions of MS–DOS will make your head go weird.

At the same time, the facilities available to the MS–DOS programmer are a bit staggering. All of the immense hardware capability of the system is supported by function calls of one sort or another. If you want to make your area code blink on and off in blue in the lower right hand corner of the tube while a smiling face rebounds off the edges of the screen... there are calls for that.

Getting into all this is a bit overwhelming. The processor has far too many registers to be comprehended easily and, what's worse, the operating system keeps wanting interrupts. Any sane programmer knows that you stay away from interrupts like cabinet ministers embrace the truth. However, the example programs in the books all have interrupts dangling from their yardarms.

We're going to have a look at using the function calls of MS–DOS.

Interruptus

Under CP/M, very much a precursor to MS–DOS, the I/O functions of the computer are handled by *system calls*. One sets up a few parameters by loading values into the processor's registers and calls location five. Location five holds a jump instruction which points to a large chunk of code which sorts out what you want by examining the registers you set up prior to the call.

This is a neat way of handling things because it involves a minimum of memory dependent programming. All you need to know about the computer your program will run on is one address... location five tells it all.

Under MS–DOS you don't need to know any locations at all. The calls are made through interrupts.

Unless you get into serious hardware hacking you rarely even have to think about interrupts on eight bit machines. Some systems don't use them at all in the normal course of working, and, where they are employed, they generally do low level housekeeping functions that don't concern the programmer.

The function of an interrupt, in a simple sense, is to implement a funny sort of subroutine call. Whenever an interrupt happens the processor will stop what it's doing, stash the current program counter... where it's at... on the stack and leap to a subroutine at a predetermined location. The location is usually fixed in the hardware of the processor. It's up to the party that made the interrupt happen to ensure that there's something there besides the vastness of space.

The advantages in using interrupts is that they can be called from anywhere and the calling routine needn't know where the interrupt routine lives. Now, in most cases this is of no use to the programmer because interrupts can only be called through hardware... you have to zap a pin on the processor to make one occur. The 8088, however, has an instruction to allow interrupts to be thrown from a program.

In fact, the 8088 allows two hundred and fifty–six levels of interrupts. The interrupt handling routine that happens is a function of what number you hang after the interrupt instruction.

All of the system functions of the IBM... the utilities that are built into MS–DOS... are arranged as interrupt calls. While you could locate the routines and use them with CALL

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
;       MENU DRIVEN SETUP PROGRAM
;       IBM PC
;       COPYRIGHT (c) 1984
;       STEVE RIMMER
;       NOT FOR USE BY NIHILISTIC MONKS
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
;
STACK   SEGMENT PARA STACK 'STACK'
;THE LOCAL STACK GOES HERE
        DB      256     DUP (0)
STACK   ENDS
;
DATA    SEGMENT PARA PUBLIC 'DATA'
;
CR      EQU     13      ;CARRIAGE RETURN
LF      EQU     10      ;LINE FEED
TAB     EQU     'I'-40H ;TAB CHARACTER
URCOR   EQU     187     ;UPPER RIGHT CURSOR
ULCOR   EQU     201     ;UPPER LEFT CORNER
LRCOR   EQU     188     ;LOWER RIGHT CORNER
LLCOR   EQU     200     ;LOWER LEFT CORNER
HMEM    EQU     205     ;HORIZONTAL MEMBER
VMEM    EQU     186     ;VERTICAL MEMBER
;
MENU0   DB      LF,LF,LF,LF,LF,LF,LF,LF,LF
        DB      VMEM,TAB,TAB,TAB,'IBM PC Screen Setup Program',CR,LF
        DB      VMEM,TAB,TAB,TAB,'Program Version 1.62',CR,LF
        DB      VMEM,TAB,TAB,TAB,'Hit any key to begin. $'
;
MENU1   DB      LF,LF,LF
        DB      VMEM,TAB,TAB,TAB,TAB,'Screen Mode Menu',CR,LF,LF,LF
        DB      VMEM,TAB,TAB,'1. 40 X 25 Black and white alpha',CR,LF
        DB      VMEM,TAB,TAB,'2. 40 X 25 Colour alpha',CR,LF
        DB      VMEM,TAB,TAB,'3. 80 X 25 Black and white alpha,',CR,LF
        DB      VMEM,TAB,TAB,'4. 80 X 25 Colour alpha',CR,LF
        DB      VMEM,TAB,TAB,'5. 320 X 200 Colour graphics',CR,LF
        DB      VMEM,TAB,TAB,'6. 320 X 200 Black and white graphics',CR,LF
        DB      VMEM,TAB,TAB,'7. 640 X 200 Black and white graphics',CR,LF,LF
        DB      VMEM,TAB,TAB,'Hit one (or RETURN for no change) $'
;
MENU2   DB      LF,LF,LF
        DB      VMEM,TAB,TAB,TAB,TAB,'Cursor Start Menu',CR,LF,LF,LF
        DB      VMEM,TAB,TAB,'Enter start line for cursor (0 to 8) $'
;
MENU3   DB      LF,LF,LF
        DB      VMEM,TAB,TAB,TAB,TAB,'Cursor End Menu',Ck,LF,LF,LF
        DB      VMEM,TAB,TAB,'Enter end line for cursor (0 to 8) $'
;
DATA    ENDS
;
CODE    SEGMENT PARA PUBLIC 'CODE'
START   PROC    FAR
;
;THIS IS THE HANDSHAKING CODE FOR THE IBM
        ASSUME  CS:CODE
        PUSH    DS      ;SAVE PSP
        MOV     AX,0
        PUSH    AX      ;SAVE RETURN ADDRESS OFFSET
        MOV     AX,DATA
        MOV     ES,AX   ;EXTRA SEGEMNT ADDRESSING
        ASSUME  ES:DATA
        MOV     DS,AX   ;DATA SEGMENT ADDRESSING
        ASSUME  DS:DATA
;
;       SAY HELLO AND GET A CHARACTER
        CALL    CLS                     ;CLEAR IT
        CALL    BOX                     ;PRINT A BOX
;
        MOV     DX,OFFSET MENU0         ;POINT TO FIRST MESSAGE
        MOV     AH,9                    ;SET UP FOR PRINT CALL
        INT     21H                     ;THROW INTERUPT
;
        CALL    GETCHR                  ;GET A CHARACTER
;
BADOPT: CALL    BOX                     ;CLEAR THE SCREEN
        MOV     DX,OFFSET MENU1         ;POINT TO SECOND MESSAGE
        MOV     AH,9                    ;SET FOR PRINT CALL
        INT     21H                     ;THROW INTERUPT
;
        CALL    GETCHR                  ;GET A CHARACTER
        CMP     AL,CR                   ;CARRIAGE RETURN
        JZ      STAR2                   ;IF SO, NEXT OPTION
        CMP     AL,'1'                  ;IS RESULT LESS THAN '1'?
        JB      BADOPT                  ;IF SO, GO AGAIN
        CMP     AL,'7'                  ;IS RESULT GREATER THAN '7'?
        JA      BADOPT                  ;IF SO. GO AGAIN
;
        SUB     AL,'1'                  ;MAKE AL BINARY VALUE
        MOV     AH,0                    ;SET UP TO CHANGE SCREEN
        INT     10H                     ;DO IT
;
STAR2:  CALL    BOX
        MOV     DX,OFFSET MENU2
        MOV     AH,9
        INT     21H                     ;SHOW NEXT MENU
;
        CALL    GETCHR                  ;GET A CHARACTER
;
        CMP     AL,CR                   ;IF RETURN...
        JZ      STAR3                   ; ...SKIP TO NEXT
        CMP     AL,'0'                  ;IF LESS THAN 0
        JB      STAR2                   ;HIT IT AGAIN
        CMP     AL,'7'                  ;IF MORE THAN 7
        JA      STAR2                   ;HIT IT AGAIN
        SUB     AL,'0'                  ;MAKE BINARY
        AND     AL,00001111B            ;MASK OFF HIGH NYBBLE
        MOV     CH,AL                   ;PUT IN C
        PUSH    CX                      ;AND SAVE IT
;
STAR3:  CALL    BOX
        MOV     DX,OFFSET MENU3
        MOV     AH,9
        INT     21H                     ;SHOW NEXT MENU
;
        CALL    GETCHR                  ;GET CHARACTER
        CMP     AL,CR                   ;IF RETURN SKIP
        JZ      STAR4
        CMP     AL,'0'
        JB      STAR3
        CMP     AL,'7'
        JA      STAR3
        SUB     AL,'0'
        AND     AL,00001111B
        POP     CX                      ;GET START VALUE BACK
;
        MOV     CL,AL                   ;SET UP CURSOR...
        MOV     AH,1                    ; ... AS PER
        INT     10H                     ;INPUT
;
STAR4:  CALL    CLS                     ;SMARTEN UP SCREEN
        RET                             ;BACK TO DOS
;
;       *** SUBMARINES
;
CLS     PROC    NEAR
        MOV     CH,0
        MOV     DH,24
        MOV     AH,0
        INT     10H                     ;SET 80 COL SCREEN
        MOV     CX,0
        MOV     BH,7
        MOV     DH,24
        MOV     DL,79
        MOV     AL,0
        MOV     AH,6
        INT     10H                     ;SCROLL SCREEN UP
        RET
CLS     ENDP
;
GETCHR  PROC    NEAR                    ;GET A CHARACTER IN AL
        MOV     AH,0
        INT     16H
        RET
GETCHR  ENDP
;
BOX     PROC    NEAR
        CALL    HOME                    ;MOM'S WAITING
;
        MOV     DL,ULCOR
        CALL    DISP                    ;SHOW UPPER LEFT CORNER
;
        MOV     CX,78
BOX1:   MOV     DL,HMEM                 ;SHOW 78 HORIZONTALS
        CALL    DISP
        LOOP    BOX1
;
        MOV     DL,URCOR                ;SHOW UPPER RIGHT CORNER
        CALL    DISP
;
        MOV     CX,22
BOX5:   MOV     DL,VMEM                 ;SHOW VERTICAL
        CALL    DISP
        PUSH    CX
        MOV     CX,78
BOX4:   MOV     DL,' '
        CALL    DISP                    ;SHOW 78 SPACES
        LOOP    BOX4
        MOV     DL,VMEM
        CALL    DISP                    ;SHOW VERTICAL
;
        POP     CX
        LOOP    BOX5
;
        MOV     DL,LLCOR
        CALL    DISP                    ;SHOW LOWER LEFT CORNER
;
        MOV     CX,78
BOX6:   MOV     DL,HMEM                 ;SHOW 78 HORIZONTALS
        CALL    DISP
        LOOP    BOX6
;
        MOV     DL,LRCOR
        CALL    DISP                    ;SHOW LOWER RIGHT CORNER
        CALL    HOME                    ;HOME CURSOR AGAIN
        RET
BOX     ENDP
;
DISP    PROC    NEAR
        PUSH    CX                      ;SAVE COUNTER
        MOV     AH,6
        INT     21H                     ;DISPLAY CHR IN DL
        POP     CX                      ;RESTORE COUNTER
        RET
DISP    ENDP
;
HOME    PROC    NEAR
        MOV     AH,15
        INT     10H                     ;SET BH TO ACTIVE PAGE
        MOV     DX,0
        MOV     AH,2
        INT     10H                     ;PLACE CURSOR IN ROW 0, COL 0
        RET
HOME    ENDP
;
START   ENDP
CODE    ENDS
        END     START
;       END OF PROGRAM
```

continued on page 46

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Charlie Meets the Interrupts

instructions, there is no point in it. Interrupts are quick, neat and take up very little space.

Although there are heaps of interrupts to call, relatively few are tied up by the DOS. Of them, many do low level things which, even in this lofty enclave, nobody really wants to mess with. Of what's left, there are two interrupts which are generally useful to programmers, these being 10H and 21H. These two little gaffers handle the system video and basic console I/O.

The program accompanying this feature is a simple example of the techniques involved in using these things. Understanding them isn't too hard... all you have to know is what to set.

Getting an interrupt to throw itself is a matter of having the processor execute the instruction INT. For the best results and no error messages from the assembler the INT should be followed by a number between zero to two hundred and fifty-five. We'll be using INT 10H and INT 21H here.

You can think of these things as having a number of sub-sections within them. Interrupt 10H, for example, has sixteen functions. The function you wind up with after calling the interrupt will be a result of the value in the AH register. Some of the functions utilize data in some of the other registers. Tables one and two outline the operations available in these two interrupts.

The Code

Looking at the program we find a structure similar to that used in the *Assembler on the IBM* article in the April issue. The reasons for most of this don't bear going into, and you can ignore the code right up until the line that says hello. Just put it in and forget it's there.

This program draws a box around the screen and presents you with several menus that'll allow you to change the characteristics of the display on your monitor. Specifically, you'll be able to select the display mode and change the size of the cursor. It's not an earth shattering thing, to be sure, but it illustrates the workings of the video interrupts.

The basic screen activity functions of the system are handled in ways that may seem a bit peculiar. For example, the first thing that one encounters in the program is a call to CLS, a routine to clear the screen. This is usually accomplished simply by printing a character or escape sequence that blanks the tube. However, the PC wants it handled by a system call.

There are two functions in the 10H interrupt which handle scrolling... one for each direction. You can use them to scroll one or two lines or you can scroll the whole

Table 1
Type 10H Interrupts

AH	Function	Before Call	After Call
0	Set video mode	(AL) = 0 40x25 B/W, Alpha (Default) = 1 40x25 Color, Alpha = 2 80x25 B/W, Alpha = 3 80x25 Color, Alpha = 4 320x200 Color, Graphics = 5 320x200 B/W, Graphics = 6 640x200 B/W, Graphics	None
1	Set cursor lines	CH Bits 0-4 = Start line for cursor CH Bits 5-7 = 0 CL Bits 0-4 = End line for cursor CL Bits 5-7 = 0	None
2	Set cursor position	(DH,DL) = Row, column (0.0) is upper left (BH) = Page number (0 for Graphics mode)	None
3	Read cursor position	(BH) = Page number (0 for Graphics mode)	(DH,DL) = Row, column of cursor (CH,CL) = Current cursor mode
4	Read light pen position	None	(AH) = 0 Light pen switch not down or not triggered (AH) = 1 Valid light pen values in registers (DH,DL) = Row, column (CH) = Raster line (0-199) (BX) = Pixel column (0-319,639)
5	Select active display page (Alpha modes)	(AL) = New page value (0-7 for Modes 0 and 1; 0-3 for Modes 2 and 3)	None
6	Scroll active page up	(AL) = Number of lines Input lines blanked at bottom of window. (AL) = 0 blanks entire window. (CH,CL) = Row, column of upper left corner of scroll (DH,DL) = Row, column of lower right corner of scroll (BH) = Attribute to be used on blank line	None
7	Scroll active page down	(AL) = Number of lines. Input lines blanked at top of window. (AL) = 0 blanks entire window. (CH,CL) = Row, column of upper left corner of scroll (DH,DL) = Row, column of lower right corner of scroll (BH) = Attribute to be used on blank line	None
8	Read attribute/ character at current cursor position	(BH) = Display page (Alpha modes)	(AL) = Character read (AH) = Attribute of character read (Alpha modes)
9	Write attribute/ character at current cursor position	(BH) = Display page (Alpha modes) (BL) = Atrribute of character (Alpha) Color of character (Graphics) (CX) = Count of characters to write (AL) = Character to write	None
10	Write character only at current cursor position	(BH) = Display page (Alpha modes) (CX) = Count of characters to write (AL) = Character to write	None
11	Set color palette (320x200 graphics)	(BH) = ID of palette color (0-127) (BL) = Color value to be uses with that color ID	None
12	Write dot	(DX) =Row number (CX) = Column number (AL) = Color value If Bit 7 of AL =1, the color value is exclusive-ORed with the current contents of the dot	None

13	Read dot	(DX) = Row number (CX) = Column number	(AL) =Dot read
14	Write character to screen, then advance cursor	(AL) = Character to write (BL) = Foreground color (Graphics) (BH) = Display page (Alpha)	None
15	Read current video state	None	(AL) = Current mode – See (AH) =0 for explanation (AH) = Number of character columns on screen (BH) =Current active display page

Table 2
Type 21H Interrupts

AH	Function	Before Call	After Call
1	Wait for keyboard character, then display it (with Ctrl-Break check)	None	(AL) = Keyboard character
2	Display a character	(DL) = Display character	None
3	Wait for asynchronous input character	None	(AL) =Asynchronous character
4	Output a character to asynchronous device	(DL) = Output character	None
5	Print a character	(DL) = Print character	None
6	Read keyboard character (without Ctrl-Break check)	(DL) =OFFH	(AL) = Keyboard character, if available
6	Display a character	(DL) =Display character (value other than OFFH)	None
7	Wait for keyboard character, but do not display it (without Ctrl-Break check)	None	(AL) = Keyboard character
8	Same as function 7, but with Ctrl-Break check	None	(AL) = Keyboard character
9	Display a string in memory	(DS:DX) = Address of string	None
A	Read keyboard characters into buffer	(DS:DX) = Address of buffer	None
B	Read keyboard status (with Ctrl-Break check)	None	(AL) =OFFH if character is available 0 if no character is available
C	Clear keyboard buffer and call a keyboard input function	(AL) = Keyboard function number 1, 6, 7, 8, or A)	Per keyboard function
D	Reset disk	None	None
E	Select default drive	(DL) = Drive number (0 = A, 1 = B)	(AL) = Number of drives in system (2 for single-drive system)
F	Open file	(DS:DX) = Address of unopened file control block (FCB)	(AL) = 0 if file is found =OFFH if file is not found
10	Close file	(DS;DX) = Address of opened FCB	Same as function F
11	Search for filename	(DS:DX) = Address of unopened FCB	(AL) = 0 if filename is found = OFFH if filename is not found
12	Find next occurrence of filename	Same as function 11	Same as function 11
13	Delete file	Same as function 11	Same as function 11
14	Read sequential file	(DS:DX) = Address of opened FCB	(AL) = 0 if transfer successful = 1 if no data in record = 2 if sufficient space = 3 if partial record is read
15	Write sequential file	Same as function 14	(AL) = 0 if transfer successful = 1 if disk is full = 2 if insufficient space

continued on next page

tube into oblivion. This latter experience is analogous to clearing the screen.

With the screen clear we can get into the first important aspect of the program, this being the drawing of the box. You don't really need a box, I know, but it looks neat and it's very easy to do.

The BOX subroutine begins with a call to the HOME subroutine to put the cursor in the upper left hand corner of the monitor. This, of course, uses an interrupt call. Function two of the 10H interrupt is the cursor positioning troll... it will scurry around with the flashing dot and place it wherever you indicate by the contents of the DX register. The DH register holds the row value and the DL takes care of the columns.

Before we can use this call, however, we must set the BH register to hold the number of the current page. Since there's no way to know what this is going to be when the program is being assembled there's a call to see what it's up to at the moment. Interrupt 10H function fifteen will do it.

The program's menus are all printed using a very useful call. Interrupt 21H function nine prints a string stored in memory terminated by a dollar sign. In other words,

Interrupt 21H function nine prints a string stored in memory...

if you load DX with a a number pointing to a location in RAM and AH with nine and heave ol' INT 21H the system will spew out every character it finds from the location DX on up until it encounters a dollar sign.

May the creator of all that's warm and plastic save your sneakers if you forget the dollar sign... you can easily watch a half a megabyte spewing across your tube.

Modern Times

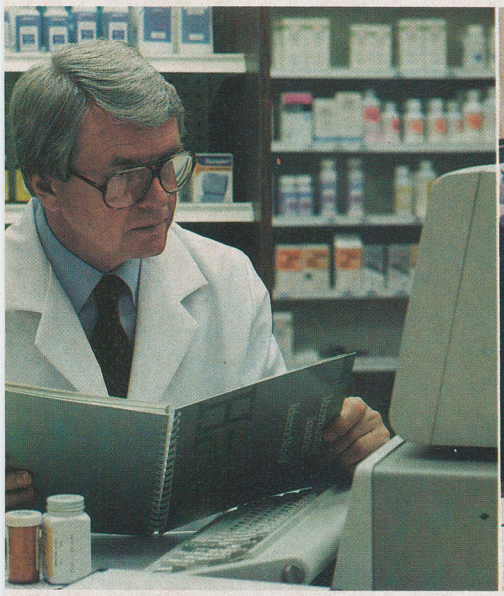
The interrupt calls are really very easy to use. Set up the right registers and you can make very nearly anything you want happen. There are calls for graphics, disk I/O, peripheral control... once you get into it the universe is yours.

While it may seem to be agonizingly complex, programming the PC can be a party if you can get your head around the way its designers meant for it to be used. Yes, they were warped little munchkins, it's true, but you're stuck with their handiwork now... best get used to it.

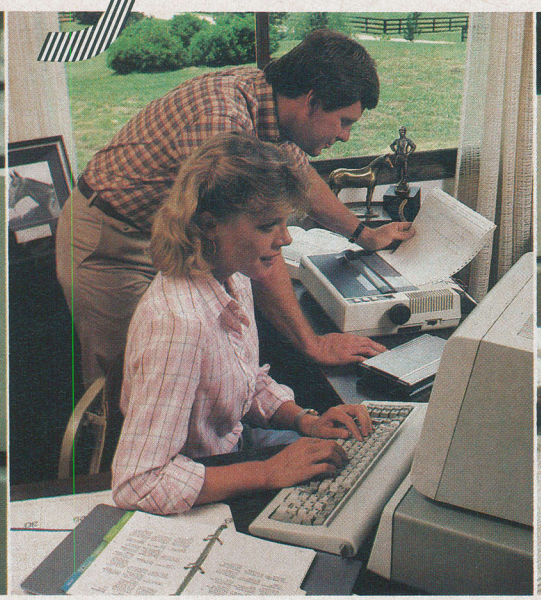
Get in there and fling those interrupts around. Charlie will never be the same.

Hayes™

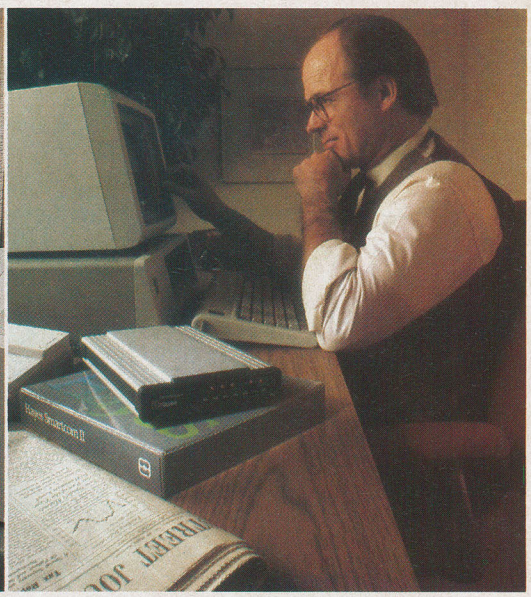
Your computer's telephone.



What are the adverse effects of this compound?



Gary: The pedigrees for next week's auction are as follows...



Sold 1000 shares at 33 for net profit of 6000. Richard.

Wouldn't it be great if you could use your IBM* PC to tap into vast resource libraries across the country? To transfer files to your partner, upstate? Or from your broker, down the street?

It's possible. All you need is a modem, to connect your computer to others. Down the hall. Or thousands of miles away.

Hayes Smartmodem. Think of it as your computer's telephone. Hayes Smartmodem 300™ and the faster Smartmodem 1200™ allow you to communicate over ordinary phone lines.

But any modem will send and receive data. Hayes Smartmodems also dial, answer and disconnect calls. Automatically. And without going through the telephone receiver, making them far superior to acoustic coupler modems.

Choose your speed; choose your price. The lower-priced Smartmodem 300 is ideal for local data swaps and communicates at 300 bps. For longer distance and larger volumes, Smartmodem 1200 operates at baud rates of 300 or 1200, with a built-in selector that automatically detects transmission speeds.

Both work with rotary dials, Touch-Tone® and key-set systems; connect to most time-sharing systems; and feature an audio speaker.

Smartmodem 1200B™ is also available as a plug-in board. Developed specifically for the PC, it comes packaged with Hayes' own communications software, Smartcom II.™

Smartcom II. We spent a lot of time developing it, so you can spend less time using it. Smartcom II prompts you in the simple steps required to create, send, receive, display, list, name and rename files. It even receives data completely unattended—especially helpful when you're sending work from home to the office, or vice versa.

If you need it, there's always "help." This feature explains prompts, messages, etc. to make communicating extra easy.

With Smartcom II, it is. Case in point: Before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once. After that, parameters for 25 different remote systems are stored in a directory on Smartcom II.

Calling or answering a system listed in the directory requires just a few quick keystrokes. You can store lengthy log-on sequences the same way. Press one key, and Smartcom II automatically connects you to a utility or information service.

Hayes™

Circle No. 10 on Reader Service Card

Charlie Meets the Interrupts

16	Create a file	(DS:DX) = Address of unopened FCB	(AL) = 0 if file is created =OFFH if no entry is empty
17	Rename a file	(DS:DX) = Address of filename to be renamed (DS:DX + 11H) = Address of new filename	(AL) = 0 if rename successful = OFFH if no match is found
19	Read default drive code	None	(AL) = Code of default drive (0 = a, 1 = B)
1A	Set disk transfer address	(DS:DX) = Disk transfer address	None
1B	Read allocation table address	None	(DS:DX) = Address of file allocation table (DX) = Number of allocation units (AL) = Records/allocation unit (CX) = Size of physical sector
21	Read random file	(DS:DX) = Address of opened FCB	Same as function 14
22	Write random file	Same as function 21	Same as function 15
23	Set file size	(DS:DX) = Address of unopened FCB	(AL) = 0 if file size is set = OFFH if no matching entry is found
24	Set random record filed	(DS:DX) = Address of opened FCB	None
26	Create a new program segment	(DX) = New segment number	None
27	Read random block	(DS:DX) = Address of opened FCB	(AL) = 0 if transfer successful =1 if end-of-file = 2 if wrap-around would occur = 3 if last record is a partial record
28	Write random block	Same as function 27	(AL) = 0 if transfer successful =1 if insufficient space
29	Parse a filename	(DS:SI) = Address of command line parse (ES:DI) = Address of memory to be filed with an unopened FCB (AL) = 1 to scan off leading separators = 0 no scan-off	(AL) = 0 if parse successful = 1 if filename contains? or* = OFFH if drive specifier is invalid
2A	Get date	None	(CX) = Year (1980-2099) (DH) = Month (1-12) (DL) = Day (1-31)
2B	Set date	(CX) and (DX) = Date, in same	(AL) = 0 if date is valid = OFFH if date is invalid
2C	Get time	None	(CH) = Hours (0-23) (CL) = Minutes (0-59) (DH) = Seconds (0-59) (DL) = 1/100 Seconds (0-99)
2D	Set time	(CX) and (DX) = Time, in same format as function 2C	(AL) = 0 if time is valid =OFFH if time is invalid
0	Terminate program	None	None
25	Set interrupt vector	(DS:DX) = Vector address (AL) = Interrupt type	None None

PC NOW!

What is MS-DOS?

If you can't quite fathom what a DOS is and why you'd want to let one into your home, you might want to look at this feature. It will help you to understand this complex bit of software.

by Steve Rimmer

It's a fairly popular rumour in the computer underground that MS-DOS, the operating system of the IBM PC and its compatibles, was created by Microsoft, the company that does up all those nice BASIC packages and language compilers. This, in fact, is not true. MS-DOS was actually found in a sealed urn by a group of archeologists digging around in some ruins in Borneo.

This goes a long way towards explaining why some people have so much trouble getting their heads around just what the thing is all about. MS-DOS has either been left to us by a long dead race of intelligent apes or it came from flying saucers in much the same way as the pyramids, the Inca roads and the Metric system.

I think it was the apes myself.

In fact, MS-DOS is a very good operating system because, be its creators apes or Martians, it was well thought out. However, like most of these things, it was designed by computer gurus for other computer gurus, and everyone else usually gets a bit lost after the second *filespec*. That's okay... I thought a filespec was like a flyspec only green for the longest time.

In the next few pages we are going to look at MS-DOS for the uninitiated. Read this article and it will grant you enlightenment... or turn you into an ape. It's hard to say which, or in fact, if there's a great deal of difference between the two.

Bananas

Let's start with the obvious introductory bit... we'll get over exactly what is meant by an "operating system". Most people think that MS-DOS is some kind of language, like BASIC. This is because many BASICs have accessory parts which fake the operations of an operating system. In fact, though, the two are usually naturally separated.

When you turn your computer on, it becomes a very powerful can opener. Many PC compatibles make very good can openers, with the rest doing sterling service as mouse crushers. After the can opener thinks a while, it will execute a very tiny program it has inside itself... called a *boot*... and, unless there's an operating system available to it in its disk drive, it will come to the end of its program, turn off its little red lights and stare into space until its warrantee expires.

Real PC's will, in fact, slip into on-board BASIC, but let's ignore that for the moment.

The little program the computer has inside it checks out the hardware and then attempts to load the first few tracks of data

from the A: disk. This information is a slightly larger program, which in turn loads a very big program which is called MS-DOS.

MS-DOS comes up, asks you the time and the date and displays a prompt to accept commands. At this point the computer starts looking like something one could reasonably deal with at a quasi-human level.

Whenever your computer is running and doing something other than booting up, MS-DOS is in there, although you probably won't see it. This is the nature of operating systems. They live behind the programs you run and make their tasks easier.

If you want to, consider that MS-DOS takes a whole bunch of diverse programs... WordStar, Lotus, BASICA, MASM and so on... and gives them a common environment to work in. This means that it provides an easy way to output things to the screen, read and write disk files... in short, built into MS-DOS are most of the functions which software usually has to perform to interact with you and the computer. These are the things called *system I/O*. The author of a program doesn't have to provide code to do this stuff... he or she can simply tap into MS-DOS.

Anyway, that's the technical definition. MS-DOS makes programs smaller and a lot cheaper because it relieves the authors of the software running under it of the task of writing I/O code. However, it also makes the computer more usable for you because it handles the other important function of computer use... people I/O.

Run For Your Life

There are three conceptual levels of MS-DOS. The lowest is the machine language level, which you needn't worry about unless you want to write assembler programs. The second is the command level... this is where you encounter the A: prompt. The third is the applications level, which is where you're at if you're running WordStar or Lotus or BASIC.

Imagine then, that the A: prompt is the lobby of a hotel. You can see what rooms are in the hotel by typing DIR. Each of the applications packages you have on your disk, plus what are called *built-in commands*... we'll get to that... are rooms. You can go to a specific room by typing its name. When you leave the room... quit the application... you'll be dropped back into the lobby, ready to select another room or to turn off the computer... check out.

If you type DIR, you will see a long list of files. Of these, only some are runnable applications. A file can hold anything you like... text, database fields, a BASIC program, a spreadsheet overlay... or a run-

What is MS-DOS?

nable application. The computer differentiates between these by looking at the *file extension*. This is the three character thing after the dot in the file name.

All application programs will have extensions EXE, for executable, or COM, for command. If you have a file called DBASE.EXE and you type DBASE at the prompt, the computer will look through its disk, find the file DBASE.EXE, go "hot damn... a live one..." and run the DBASE application. If, on the other hand, there was only a file called DBASE.BAS, the computer would not recognize the command and print a "Bad Command" error message.

If you had a file called DBASE.BAS, very likely a database program written in BASIC... that's what the BAS means... you could still run it. You would run BASIC.EXE... type BASIC... and then LOAD and RUN DBASE. This is because the computer can't handle BASIC programs by itself. You have to get it running BASIC and let BASIC handle the BAS file.

BASIC, then, is a translator. It translates the instructions you wrote in BASIC into instructions the computer can understand. In fact, all applications can be thought of as translators... they are all big programs which contain sophisticated rules for translating your keystrokes into instructions which can be passed to MS-DOS, and then, along to the computer itself.

Select One

If your PC is like most, it will have two disk drives. These are usually called A: and B:. When referring to a drive we always put a colon after its letter... colons aren't used for anything else, and as such, make useful shorthand for the system.

When you turn the system on you will be logged onto drive A:. This means if you issue a command to the computer the operating system will look for the file you've named on drive A:. You can go to drive B: by typing B: and hitting return. The prompt will change to reflect the drive you're logged onto and now all your activity will take place on drive B:.

The drive you are logged onto is called the *default* drive. This means that unless you tell the machine otherwise everything will refer to the logged in drive.

You can access a drive without having logged onto it. For example, quite often you will want to use a program, say WordStar, from drive A:, but use it to access a file on drive B:. To do this you'd arrange to be logged into drive A: and type WS B:WOMBAT.DOC. This means "load up WS from drive A: and have it edit the file WOMBAT.DOC which languishes on drive B:" ...or words to this effect.

You can also run a file on another drive without changing your default drive. If you type B:WS WOMBAT.DOC from drive A:, you are saying "load up WS from drive B: and have it edit the file WOMBAT.DOC on drive A:". This may be a bit confusing. You have told MS-DOS to look for the file WS.COM on drive B:. You've told WS to load up the file WOMBAT.DOC, which is to be found... well, you didn't actually specify where it is to be found so the system will look on the default drive... which is still A:.

No Charge Extras

I said that for a command to be recognized by MS-DOS it has to be on the disk in the form of a COM or EXE file. This isn't entirely true, in fact because MS-DOS has some built in commands which it provides for doing simple disk file manipulations. These are generally housekeeping functions.

You can imagine this working like a list. When you issue a command MS-DOS will see if it matches any of the commands it has built in. DIR, for example, is a built in command for looking at the files on the disk. If it finds a match in its internal list, it performs a built-in routine and returns you to the prompt.

If it fails to get a rise out of its own stuff, it goes to the disk for a scan. If it finds a file that matches the command, it loads it, executes it, and when that application is finished, returns you to the prompt.

If it fails to find a match on the disk, it prints an error message.

The built-in commands of MS-DOS are actually pretty rich, although many of them will not be of much use for normal operation. Of them, many will be largely self explanatory... things like DIR for the directory, COPY to transfer files and so on.

We'll look at them in greater detail shortly.

The last aspect of things is what are called *utilities*. These free ranging sloths are like built-in commands but they aren't... they do low level stuff, but they exist on the disk as COM files and are treated like applications. Usually they're pretty small files and are, again, just housekeepers. They're best treated like built-in trolls, but you must make sure they're on your disk if you want to use them.

As an additional source of confusion, MS-DOS comes in two radically different versions called DOS one and DOS two. The former is a fairly straight up operating system with few frills. The latter encompasses everything the former does and adds a whole seething moss encrusted trove of options, features and utilities. We're going to ignore DOS 2.0 for the time being... if you have it, you can pretend that it's DOS 1.25 quite successfully... the extra commands don't venture from their caves unless you antagonize them.

All The Toys

When you first turn on your computer, you'll probably want to know what you have on the disk. Unless you have strawberry jam there... in which case you'll likely need a new disk... you can manage this by typing DIR. DIR will print up a long list of names, the number of bytes, the files they represent and occupy when they were created. If you entered a time and date when the system booted, any files you create will be time and date stamped too, and will show up thus in the directory.

I hate time and date stamps and all the files on my system were created on December 22, 1066.

The directory listing generally scrolls off the page when you do a DIR, which is a drag, so you may type instead DIR /W, which means to show you all the files on one page... a wide listing... with multiple names on a line.

The next most useful command is COPY. This moves files from one disk to the other, or copies one file into another file of a different name. The form of copy is:

```
COPY A:NOWFILE
B:FILETO.BE
```

This means that the file after the first disk specifier, is the file you are copying from and the file after the second, is where it is going. This will copy NOWFILE on drive A: to drive B:, but the file will be called FILETO.BE on B:. Usually you don't want to rename files so you say:

```
COPY A:NOWFILE B:
```

By leaving the name after the second specifier blank, you are telling MS-DOS to default to the name of the file as it stands.

In the language of the intelligent apes, the first name is the *source* and the second is the *destination*.

In many cases you will want to copy multiple files. For example, suppose you wanted to make up a disk having all the COM files now on your current disk. You could copy each one of them over, but this would addle your brain and make your fingers flat, and very soon people would take you for a cabinet minister. There is a better way... you can use wildcards. A wildcard is an asterisk, a character which means "anything".

```
COPY A:*.COM B:
```

means "copy any file on A: with a name and the extension COM to B:."

```
COPY A:*.* B:
```

means to copy any file with a name... which basically means any file.

It may be interesting to note that the same disk that you use in your PC will also accept data from an Apple, a Commodore 64 and an Emulator computer music synthesizer. There's nothing special about the medium itself... what makes the PC unique is the *format* in which the information is stored on the disk.

When you go to put a file on the disk, the computer will want to place its information down in a certain arrangement of tracks. In order to do this, the disk must have first had the tracks laid down on it and filled with dummy characters. This is done by *formatting* a disk.

The FORMAT command is actually a utility, rather than a built-in command. You have to format each new blank disk before you use it. It's not that hard... just put a blank disk in B: and type:

```
FORMAT B:
```

On any given MS-DOS disk, there will be a bunch of files on it which you'd normally work with, and two that you wouldn't... largely because they are normally invisible. These are called the system files and contain, among other things, all the built-in commands of MS-DOS. A newly formatted disk does not have these files, and if you tried to start the computer with one, it would cause one of a variety of colourful error messages to leap out at you, fangs snapping. Thus, you must always copy the system files to your new disk.

In MS-DOS, one uses a separate utilty called SYS to manage this. To transfer the system files you'd type:

```
SYS B:
```

assuming that the files were to go to the formatted disk in drive B:.

Occasionally you will find that you have files on your disk that you don't feel like keeping around. These can be killed using the DEL command. If you type DEL WOMBAT.DOC, the file called WOMBAT.DOC will disappear from the disk directory listing. DEL *.DOC will snuff all the DOC files, and DEL *.* will erase everything on the disk... ahem, including the invisible system files. In essence, you will have a newly formatted disk again.

It's interesting to note that when you DEL a file, its information is not erased from the disk... MS-DOS simply marks it so that it doesn't show up in the directory. It also declares open season on the space it occupies, so that files written to the disk later on are permitted to overwrite it. In a future issue we'll look at ways to unDELete a file.

There are other commands you will find yourself using frequently. CHKDSK, for example, will tell you how much space is left on your disk and how much memory your system thinks it has. TYPE will display a text file on the screen... if say, TYPE WOMBAT.DOC whatever is in the file, WOMBAT.DOC will scroll past on your tube. DISKCOPY will transfer all of the files on one disk to a second... presumably blank one.

Long Path

There is, of course, a lot more to the MS-DOS operating system than we've looked at here. In fact, there are whole books which devote themselves to its intricacies. However, like many things related to microcomputers, it takes very little to understand MS-DOS enough to make effective use of it.

We'll look at some of the less essential features and some of the enhancements available in DOS 2.0 in another article. These will include wonders like multiple directories, batch files, command paths and the mythical CORPOR.ATE file which, so legend tells us, loads itself into the system and displays a surrealistic Fritz Lang silent film in high resolution graphics while the speaker peeps and pops honky-tonk piano music.

A tiny man with frizzy hair, a moustache and a bowler hat scurries across the stage chasing a many-legged blue IC chip attempting to brain it with a cane. Failing this, the tiny man eventually disappears and the chase is resumed by a pack of frothing lawyers. The climax comes when the system activates both its drives at once and turns of a tiny black light bulb secreted inside it which erases all the firmware chips and disables the computer permanently.

With the final seconds of life left to it, the PC boots WordStar and creates a suicide document. "I can no longer live with my co-processor..."

CN!

Rescue Your 64

The Commodore 64 is difficult to hang but, once you actually manage to do it it's all but impossible to unhang without powering it down. Here's a simple, relatively painless fix.

In getting more deeply into the programming of the Commodore 64 programmers invariably start to stray outside the protective womb of the BASIC interpreter. It starts with a few PEEKs and POKEs and then... it just envelopes the whole system like something that comes from Mars on the late late movie. Pretty soon you have machine code popping away in every odd bit of RAM and your BASIC programs start looking like hieroglyphics.

And, shortly thereafter the whole thing hangs on you.

Now, with a stock 64, hanging the system means several minutes of determined weeping followed by an agonized stab at the RUN/STOP and RESTORE keys... which rarely gets you out of this kind of glitch intact... and, finally, a reach for the power switch to reboot the computer... and trash your program. The unfortunate part of all this is not only that you'll have to reload or even re-enter the code you lost. What's worse is that you won't even be able to look at what caused the thing to crash the last time.

While this is the lot of the stock 64, there are ways around it of you don't mind making a few very trivial changes to your system. Having done so, you'll discover that you can get out of most any hang with your code intact... and live to debug another day.

Something More for my 64

The 6510 microprocessor that drives the 64 has a pin called the RESET. If you pull this pin low... ground it... and then return it to a logical one, the processor will do an indirect jump with the value in the reset vector, locations $FFFC and $FFFD. Okay, forget that. As far as the 64 is concerned, this will cause the computer to reset itself back to its fresh, just powered up state.

The address in these aforementioned locations points to the part of the 64's workings that make it clean up its mind and start anew. Unfortunately, this trashes all the memory contents.

Okay, forget that too. In fact, what really happens is that the computer tells itself that it has trashed all the memory contents. This is a bit different.

You see, when the Commodore is cheerfully computing away it maintains a number of *pointers*. These are numbers which reflect the locations in memory which certain parts of the computer's internal organization start and stop at. There's a pointer for the beginning of the current program and one for where it ends. If you add a line the latter one moves farther up into memory. If you type NEW the latter moves down until it equals the former.

When you do a reset by causing the 6510 to jump to its resetting routine you are essentially... among other things... doing a NEW.

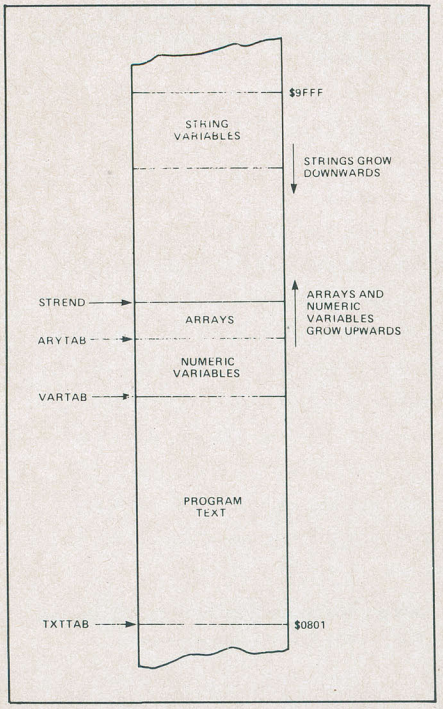


Figure 1. The general storage method for BASIC programs on the Commodore 64.

However, if you think about it, your program is still in there. It's just hidden because the 64 thinks that it's gone. The text of the program, however, remains above the pointer.

The pointers which matter for this article are all in page zero of the computer's memory. $2B and $2C hold the start of the current BASIC program. $2D and $2E hold the start of variable space. $2F and $30 hold the start of array space. $31 and $32 hold the end of array space. See figure one for a look at what these things really point to.

Normally, BASIC starts at location $0801. Prior to running a program for the first time, the other three pointers will all point to the same place... the top of the program in memory.

When there's no program in the computer... or after a reset or a NEW... the latter three pointers point to $0803. This is the bottom of the program RAM plus two bytes which are used by the machine for an end of program marker.

In order to restore the pointers after a reset, we must find out where the end of the program actually is and put this value in the appropriate pointer locations.

Now, this is actually not all that difficult because the lines in BASIC are stored as what is called a "linked list". That is, each line points to the beginning of the next. The end of the final line is terminated by the aforementioned two byte end of program marker which is, in fact, two nulls... CHR$(0) CHR$(0). See figure two for a simple example of how this works.

To find the end of the program then, we simply look at the first pair of bytes as pointed to by the start of BASIC pointer. If it isn't a pair of nulls, we look at the location pointed to by it. If that location isn't a pair of nulls we look at the location pointed to by it... and so on, until the process returns a couple of zeros.

Having found the location with two zeros in it it's a simple matter to POKE the two bytes which represent this location into the

Rescue Your 64

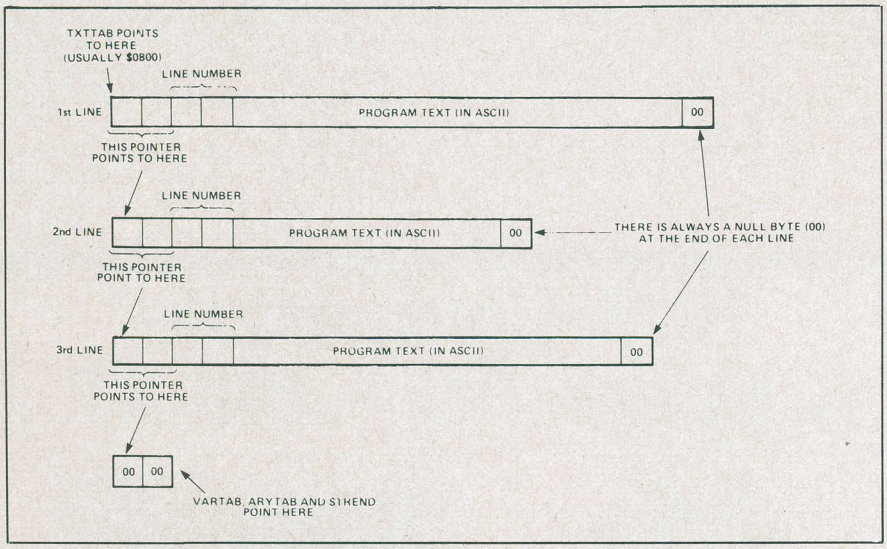


Figure 2. How BASIC lines are stored in a three-line program.

latter three pointers we mentioned a while back, making the 64 think it has a full head of program once again.

At Least, I Think So

Having said all this, there are a few nagging bits of reality to cope with. To wit, we must first arrange for a convenient way to cause a reliable reset of the 6510 whenever we feel like it and, secondly, we will need some software to do all that scanning and linking of lists for us... lest we spend several hours PEEKing through the bytes.

The first problem simply entails adding a reset switch to the computer, merely a pushbutton to pull the reset line of the chip low. You can solder one in as shown in figure three. If you don't like the idea of modifying your computer you can use the technique shown in figure four, which results in a plug in adapter that attaches to the serial port connector.

The second approach in a better scene if you fear the demise of your system's warranty which almost always comes with soldering things to it.

The next aspect of things is the software. It... ahem... must be loaded before you start meddling with unpleasant code. It's no use after the system has hung, because the very act of loading it in will reset the pointers.

The source code is shown here but don't let this bother you. It's just for users who want to see how the thing works. You can use list one, which is a BASIC loader for the program. Load and run this first thing and it will hide the code away in high memory until it's needed. If you do find you need it, simply hit the reset switch and type SYS 49152 and, like obsequious computer salesmen, your program will suddenly appear before you.

Incidentally, this code is what is called *relocatable*, and, as such, you can have the BASIC loader POKE it into any area of memory you have free. However, keep in mind that BASIC overwrites everything below $0300 upon resetting itself.

Newer Than NEW

This little program and your reset switch will make your 64 largely indestructible... at least from the inside. All but the funkiest code will be unable to permanently fry it.

An additional feature of all this is that it will also recover from accidentally typing NEW... simply SYS to the routine and all the pointers will be reset as they were before you began cursing your fingers.

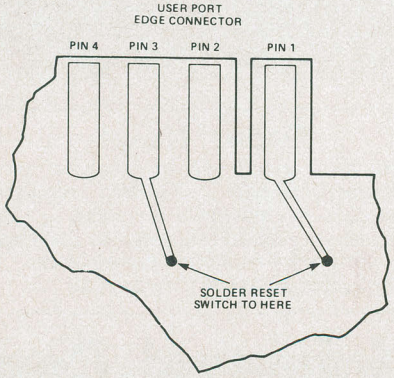


Figure 3. Solder point locations for fitting a reset switch.

Listing 1. The BASIC program to POKE the machine code into memory. It is completely relocatable.

```
10 FOR X=0 TO 83
20 READ Q : POKE 49152+X,Q
30 NEXT X
40 END
50 DATA 169,1,133,253,169,8,133,254
60 DATA 160,4,169,0,209,253,240,4
70 DATA 200,56,176,248,200,152,160,0
80 DATA 24,101,253,145,253,200,169,0
90 DATA 101,254,145,253,160,0,177,253
100 DATA 208,27,200,177,253,208,22,169
110 DATA 2,24,101,253,133,45,133,47
120 DATA 133,49,169,0,101,254,133,46
130 DATA 133,48,133,50,96,160,0,177
140 DATA 253,170,200,177,253,133,254,134
150 DATA 253,56,176,208
```

Listing 2. The assembly listing of the OLD program.

```
;OLD routine for the Commodore 64
;
;
;Copyright (c) A.L.Cross 1983
;
;
        *=      $C000       ;Set routine start
;
;
;Variables and equates
;
TEXT    =       $0801       ;BASIC prog start
VARTAB  =       $2D         ;BASIC variables start
ARYTAB  =       $2F         ;BASIC arrays start
STREND  =       $31         ;BASIC strings end
LINPTR  =       $FD         ;Pointer
;
;
;First initialise LINPTR to point to the start
;of the BASIC program.
;
OLD     LDA     #<TEXT      ;
        STA     LINPTR      ;Copy prog start
        LDA     #>TEXT      ;address to LINPTR.
        STA     LINPTR+1    ;
;Now restore the pointer on the first line of
;the program. (It must point to the second line).
;
        LDY     #$04        ;Initialise index.
        LDA     #$00        ;Search character.
INITLP  CMP     (LINPTR),Y  ;
        BEQ     FNDEND      ;Scan for end of
        INY                 ;first BASIC line.
        SEC                 ;(Look for null).
        BCS     INITLP      ;
```

Contest Extended!

Win This Car!

Computing Now! magazine has been so phenomenally successful in the year of its existence that we hardly know what to do with ourselves. Beginning with a readership of exactly zero last April, CN! has risen to be the best selling Canadian computing magazine.

It's gone so well that all the editorial people drive these nifty British cars now.

The subscription department over here has also grown ... there are a lot of people out there who realize that it's much easier to pop $22.95 for one year subscription (or $37.95 for two years) than it is to motor on down to the corner store every month and spend about fifty percent more.

The subscription girls work so hard we gave them all cars too.

The lads who stick the magazine together have also had their hands full as CN! has grown from eighty to over a hundred pages in some months. While we were out shopping for wheels we decided that it would make the parking lot considerably more homogenous if they could have imports as well.

The thing is, we got a six pack of Rolls' last month, and, well there's one left over, so we'd like to give it to you. Here's all you have to do to win this fabulous car (and funky hood ornament).

Simply be the ten millionth subscriber to Computing Now!. You can send in a one or two year subscription. Contestants must hold valid driver's licences, all entries must be post marked before midnight July 31, 1984 to qualify.

Computing Now! Win A Rolls Contest
25 Overlea Boulevard, Suite 601
Toronto, Ontario
M4H 1B1

In the unlikely event that we don't reach ten million subscribers by the end of July, we'll keep the car.

```
FNDEND  INY                     ;Step over null.
        TYA
        LDY     #$00            ;Initialise index.
        CLC                     ;Calculate pointer
        ADC     LINPTR          ;value.
        STA     (LINPTR),Y      ;Put low byte back.
        INY
        LDA     #$00
        ADC     LINPTR+1        ;Add in any carry.
        STA     (LINPTR),Y      ;Put high byte back.
;
;Now run down the line pointers looking for the
;end of the program. (Two consecutive nulls in
;the line pointer locations).
;
MAINLP  LDY     #$00            ;Initialise index.
        LDA     (LINPTR),Y      ;Get low pointer byte.
        BNE     NOTEND          ;Is it null?
        INY
        LDA     (LINPTR),Y      ;Get high pointer byte.
        BNE     NOTEND          ;Is it null?
```

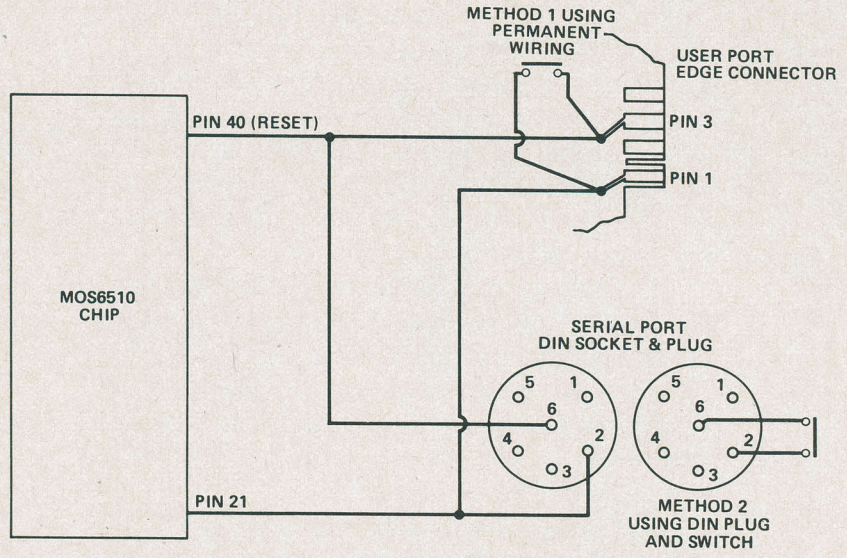
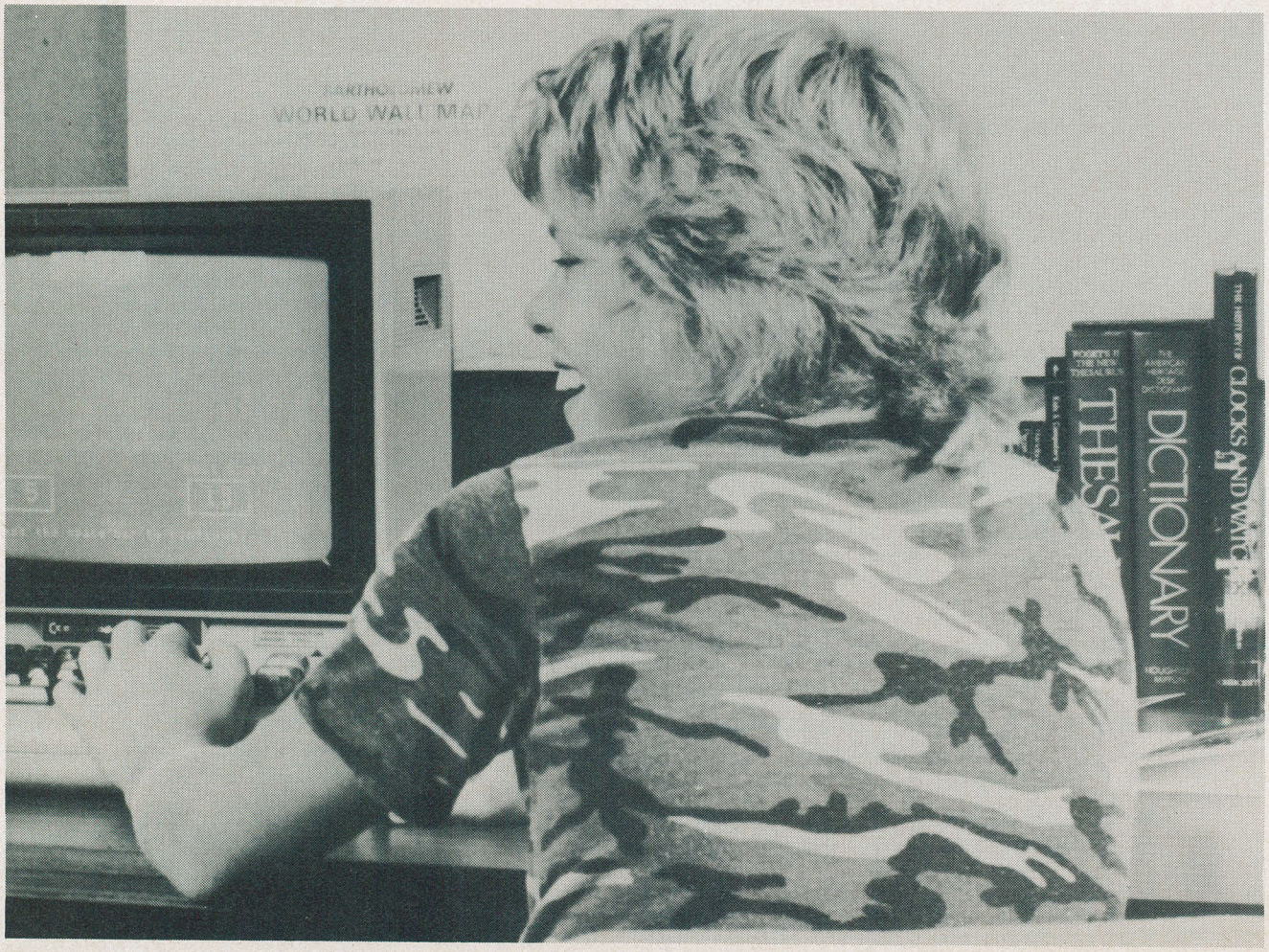


Figure 4. The two methods of wiring the switch



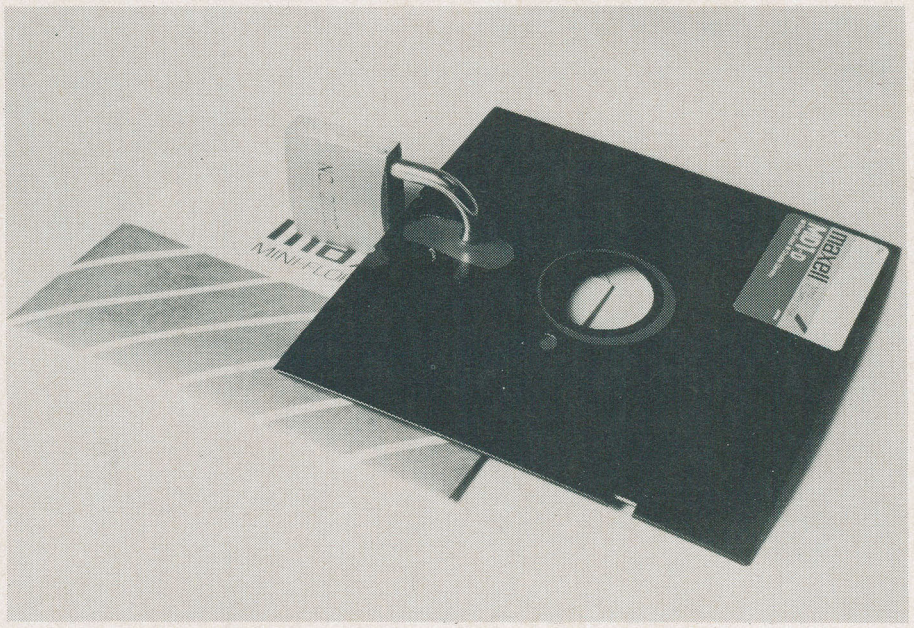
```
;End of program reached - copy address of the
;byte following the two nulls to VARTAB, ARYTAB
;and STREND.
;
        LDA     #$2         ;Step over two nulls.
        CLC                 ;
        ADC     LINPTR      ;
        STA     VARPTR      ;Low pointer bytes.
        STA     ARYPTR      ;
        STA     STREND      ;
        LDA     #$0         ;Add in any carry.
        ADC     LINPTR+1    ;
        STA     VARTAB+1    ;High pointer bytes.
        STA     ARYTAB+1    ;
        STA     STREND+1    ;
        RTS                 ;Routine finished.
;
;End of program not reached - read pointer to
;next program line.
;
NOTEND  LDY     #$00        ;Initialise index.
        LDA     (LINPTR),Y  ;Get low pointer byte.
        TAX
        INY
        LDA     (LINPTR),Y  ;Get high pointer byte.
        STA     LINPTR+1    ;Update LINPTR to
        STX     LINPTR      ;point to next line.
        SEC
        BCS     MAINLP      ;Repeat.
```

CN!

Nybble Copiers

Protected Apple disk programs are the epitome of perfection, but they tend to be a tad disappointing after being placed in a toaster by myopic users. The programs described here are a sight for sore eyes.

by Ellery Henn



Accidents happen. People slip on icy sidewalks and banana peels, milk gets spilt, tail lights get broken in bumper to bumper traffic, and nine hundred dollar programs get gorched.

It's a fact of life.

Around the home and office environment, there are literally hundreds of potential hazards lurking in wait to transform an expensive and vital piece of software into a dripping thirty–eight cent mylar doughnut. Cigarette smoke, dust, and coffee baths tend to be the more insideous offenders, though even the most careful user will likely lose some data through either neglect or overuse.

When you purchase software, the manufacturers of same assume that you realize that the data encoded on the disks supplied is finite. Friction occurs between the drive head and the disk's surface during every read and write operation, after all. For this reason, then, the disk ...often *only* the disk... is guaranteed for a limited time.

An obvious solution would be to back up your software upon purchase, storing the copies away where the elements can't reach them, but a problem arises... many disks feature copy protection.

Track Meet

Apple program copy protection has been around practically as long as the Apple II + in its inherent forms. When first introduced, its main purpose was to thwart both FID and COPYA, two utilities that reside on the Apple DOS disk.

The solution was a simple one. Both utilities look for the catalog from the disk to be copied on track seventeen, sector zero. If it isn't there, they determine something is horribly wrong and bomb out with an appropriate error message.

Moving the catalog to a different track as a means of protection was an effective deterrent for ... well, weeks. Soon, other programs appeared on the market that weren't interested where a disk's catalog resided. This initiated a scramble on both sides of the scale that has culminated in incredible advances in both the coding and decoding of software. Let's have a look around...

To better understand how copy protection is accomplished, and then gotten around, it's necessary to know how the Apple reads and writes to the disk.

After the disk has been INITed by DOS, three of the thirty five tracks are unusable... the catalog normally on track $11 and the DOS image residing on tracks one and two. Track zero is needed for booting information. In all, this leaves the user with roughly four hundred and ninety-six sectors to play with at sixteen sectors per track. This all boils down to about one hundred and twenty-six kilobytes of useable space.

Somehow, all this has to be addressed so that the read/write head knows where to go when called upon. A number of disk drives use the hard sectoring method... a diode in the drive makes use of the sector hole near the centre of the disk to judge positioning. Apple drives, however, use "soft" sectoring, where the addressing is in software... on the disk.

When data is being either written to or taken from the disk, an eight bit data "latch" is used as a buffer. In a write action, where the bits 'one, zero, one, one' are already in the latch, the rightmost one is sent to the disk leaving...

00000101

...and, as the head moves a fraction, the next 'one' is written. During a read, the latch picks up the individual bits and pushes the existing bits back, so that if the drive head has picked up the above configuration and picks up another 'one', it'll look like this

00010111

Apple disks are divided into addressing when INITed. On the disk, the addressing is divided into two major fields separated by three gaps of "self-sync" bytes... I'll get into that in a second.

The address field begins with a three byte lead in... normally D5 AA 96... and contains the disk volume number, the current track and sector addresses, a checksum and a three byte trailer of DE AA EB. This field is preceded and followed by a slew of self-sync bytes, usually $FF, that give the drive read/write head time to prepare for the upcoming field.

After the second gap of $FF bytes comes the data field, beginning with a three byte lead in of D5 AA AD, three hundred and forty-two bytes of encoded data, a checksum and a trailer of DE AA EB. Following the data field is yet another gap of self-sync bytes.

Actually, the self-sync bytes aren't truly $FF bytes... they're ten bit bytes that look like 1111111100. The extra zeroes are to allow the hardware to recognize them as self-sync bytes, and to treat them only as dividers in the stead of valid data.

Frighteningly complex, isn't it?

Locks and Keys

Simple copy protection is easily had. If you were to go into the Apple monitor after loading DOS, type "AC01:10" and control C back to reality, you'd have changed the location that DOS uses to look for the catalog. From this point, if you INITed a disk, the catalog would be written on track $10, and, so long as you kept $AC01 at ten hex, you'd be

Figure 1

```
HEX 00000000000000001111111111111111222
TRK 0123456789ABCDEF0123456789ABCDEF0123
.00 .........*.................*********
.25
.50
.75

          16 SECTOR FAST.DISK VERIFY
    0123456789ABCDEF0123456789ABCDEF0123
 SO .........A.................AAAAAAAAA
  1 .........A.................AAAAAAAAA
  2 .........A.................AAAAAAAAA
  3 .........A.................AAAAAAAAA
  4 .........A.................AAAAAAAAA
  5 .........A.................AAAAAAAAA
  6 .........A.................AAAAAAAAA
  7 .........A.................AAAAAAAAA
  8 .........A.................AAAAAAAAA
  9 .........A.................AAAAAAAAA
  A .........A.................AAAAAAAAA
  B .........A.................AAAAAAAAA
  C .........A.................AAAAAAAAA
  D .........A.................AAAAAAAAA
  E .........A.................AAAAAAAAA
  F .........A.................AAAAAAAAA
```

Ten tracks didn't verify in the preliminary copy. The 'A's indicate addressing problems.

able to save programs to the disk. If you used a simple copy utility like COPYA, though, nothing useful would happen unless you placed the appropriate track number at $AC01.

Copy protected disks on the market today usually regard this as child's play. The three bytes that usually precede the address and data fields can be changed... with care... to confuse would be copiers. The self-sync bytes that span the two fields can also be changed to the same effect.

Half, three quarter, and even quarter tracking can be used, where the disk drive only writes incrementally through the disk. Nybble preservation, where a byte count on selected tracks is written elsewhere on the disk, is another popular method of protection. It's been stated, however, that anything coded can be decoded, and that's what nybble copiers claim to do.

Nybble Me Timbers

At present, there are a number of nybble copiers on the market, and, while they differ from each other in the extra utilities they offer, they generally behave similarly when they get down to copying a disk.

Nybble Copiers

Standard copy programs, like COPYA, read in data from a disk a sector at a time, whereas nybble copiers take in eight sectors, verify the bytes, read in another eight sectors and write the entire track to the copy. What is lost in time verifying each read and each write is offset by the accuracy of the copy.

Much is assumed by these programs, however. They expect that the self-sync timing bytes are ten bit $FFs. They expect the address fields to begin with D5 AA 96 and the data fields to start with D5 AA AD. They essentially expect everything to be in its proper place... or they'll throw an error message at you.

The major strength of these programs lies in your ability to modify "parameters" within the program to make those errors correct themselves. The parameters used vary from program to program, of course. *Back It Up II*, from Sensible Software, uses parameter number 05 as the first value in any sector's address field. This parameter's default value is D5, but can be changed if a sector analysis indicates that the protected disk uses another value. When you correctly determine the copy protection on a disk and change the necessary parameters in a nybble copy program, you usually end up with a correctly copied track for your troubles.

The latest generation of nybble copiers are relying less on parameter changes and more on built-in diagnostics. *Locksmith 5.0*, from Omega MicroWare... its latest release to date... can copy almost any program without parameter changes. It can determine changed message headers and trailers, find unusual self-sync bytes and act accordingly all without operator assistance. Nybble counting, once an unspeakable curse that required tweaking a potentiometer on your disk drive for hours on end can, for the most part, be handled by the new software involved. In all, it's a fine program.

All nybble copiers have their plusses... *Copy][+* from Central Point Software includes a number of disk utilities that make it well worth its purchase price. Among these are a track and sector map which you can utilise to enter either text or hexadecimal values directly to the disk, the capacity for viewing of any file by text or values and catalogs which display information including the beginning addresses and lengths of files, hidden characters in file names and deleted files. There's also a delete DOS function to allow two extra tracks of information to be written to the disk at your leisure.

Nibbles Away][, another bit copier, allows the user to see a disassembly of a sector being edited. This is a great help when looking at track zero to see what changes to DOS were made when the disk was initialised.

```
HEX 00000000000000001111111111111111112222
TRK 0123456789ABCDEF0123456789ABCDEF0123
.00             0
.25
.50
.75

                BACKUP/COPY DISK



TRACK 09.00-7B+ 0D+ 27- 26+ 33+ 0E
      7F 7F 7F 7F 7F 7F 7F 7F
TRKST 7F 7F 7F 7F AA 95 96 AA
      AA AE AB AA AA AE AB DE    188F
22+ 31+ 43+ 71+ 7C- 50+ 77+ 70+ 7C- 50+
77+ 70+ 7C- 50+ 77+ 70+ 7C- 50+ 77+ 70+
7C+ 70+
```

Figure 2

Track nine took twenty seconds to copy properly, while . . .

Figure 3

```
HEX 00000000000000001111111111111111112222
TRK 0123456789ABCDEF0123456789ABCDEF0123
.00             0                EEEEEEEEE
.25
.50
.75

                QUICK SCAN DISK
```

. . . erasing nine tracks took eight seconds.

As a service to their customers, most companies that produce nybble copiers supply updated lists of copying information to registered users every now and then. Essentially, the mood is that if the software house supplies a free backup disk with the program, or offers one for a minimal charge, then it's unnecessary to publish copying information. If the manufacturer only offers backups for half the price of the original program, however, then the purchaser should be allowed to protect his or her investment.

And Now, the Punchline

At this point, I'm going to copy a nameless protected disk that I have absolutely no parameters for. Not an easy task, this, as I have to determine what kind of copy protection is being utilised.

Figure one is the result of a disk verify with the Locksmith 5.0 program. I used COPYA to determine if the disk would take, but it had other ideas. I backed up the original with Locksmith's fast disk copy and got the same errors as with the verification... these were addressing troubles on track nine hex, as well as similar problems with tracks $1A to $22.

I'm no fool... I went for track $09 first. It looked easy. Selecting BACKUP/COPY DISK from the main menu, I answered the ensuing questions with their default answers and hoped for the best. After a long analysis, the corrected track was written successfully to the copy, and, after verification, a zero... meaning successful copy... rested under track nine. Notice the unusual address header following the non-standard self-sync $7F bytes in figure two.

Still no fool, I decided that the other tracks that gave me problems were similarly protected and went at them viciously... and I was

pummelled with errors from here to Tuesday. This was a bad choice. QUICK SCAN DISK from the menu showed me that there was absolutely nothing on the last nine tracks. Aha! I booted my copy and looked at a text page that resembled a Picasso painted in his cubist years. I pondered on why this might be.

Apparently, the software did a check of those last nine tracks. If a stray bit landed on them from a remote galaxy, it was a sign to stop booting. When I used the fast copy utility, data of some sort was written to those rebellious tracks.

Booting Locksmith again, I erased the nine tracks from my copy disk. Powering down, I write protected my copy, inserted it in drive one, took a deep breath and flicked the switch.

A perfect copy lunged to the screen.

Note that I didn't "crack" the software. Cracking is a euphemism for the complete removal of copy protection, thereby allowing it to be copied by virtually anything. All I did was back up the disk. If I wanted to make a copy of the copy, I'd have to go through the same procedure again, though I'd be less wanton with the last nine tracks.

Ethics... What Ethics?

Programs like Locksmith and its cousins give anyone with a suitable system and an hour to kill the ability to copy disks which the manufacturers of said disks have implied are not to be duplicated. They've implied this by trying to make the task impossible, a notification which generally works better than printing something nasty on the label.

Now, we'll all probably agree that making a copy of your new "Galactic Foot Monsters" game so you can peddle it downtown on Saturday morning is wrong and has no ethical redemption at all. People who do this should be shot or, better still, simply deleted. If for no other reason, anyone bright enough to write "Galactic Foot Monsters" is going to be bright enough to recognize that there is much less piracy among owners of IBM systems... and all future works may well be directed to this market.

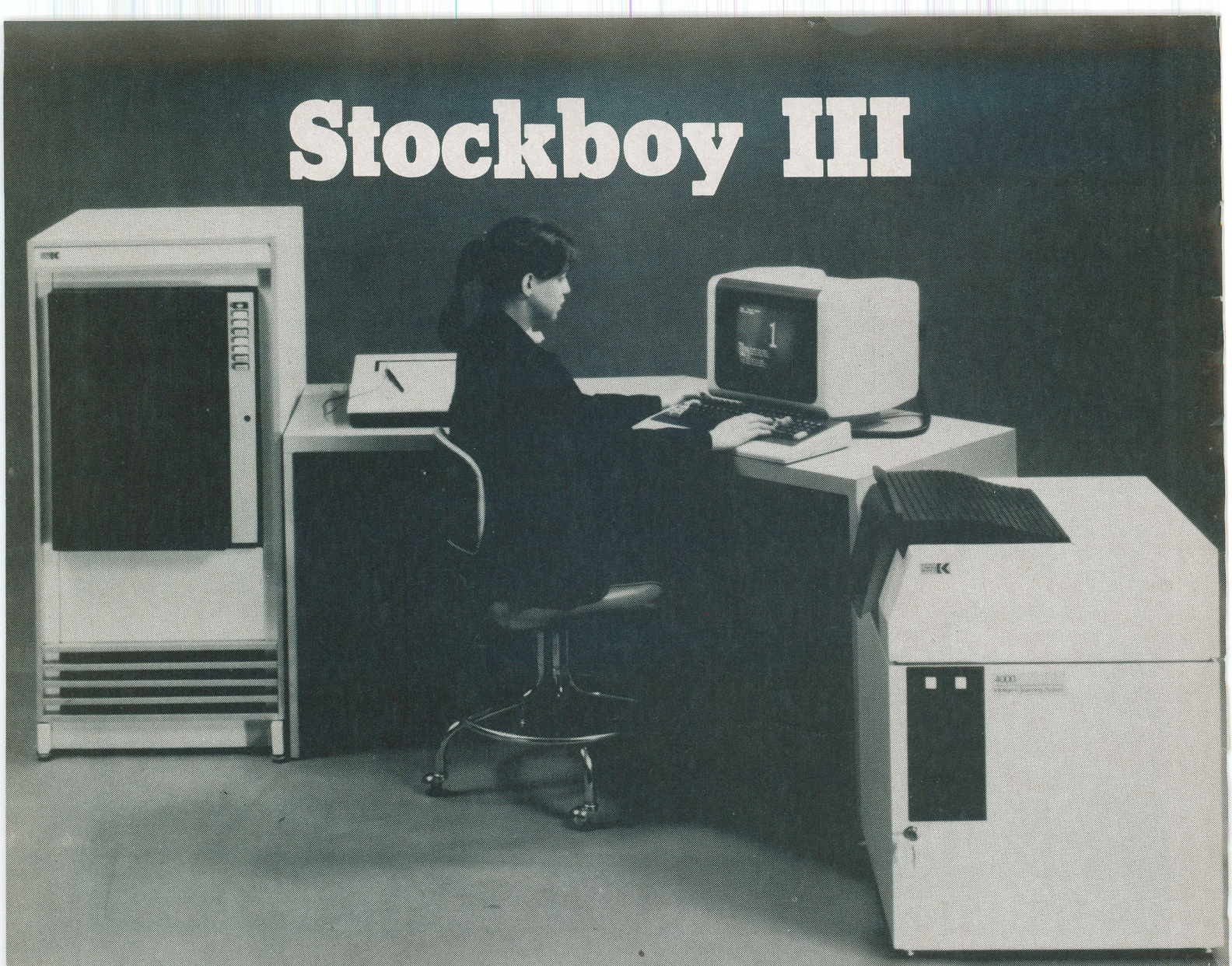
Software piracy is theft.

However, software copy protection is also theft. The thing is, in this case the soul who buys the original disk is getting thieved... thefted... whatever. If you buy a program you are buying the right to use it. Since there is no limit to the number of times you can use it specified on the front of the package, you are entitled to use it in perpetuity.

Disks of course, are not perpetual storage devices. The only way you can exercise the rights you've paid for is to back up your disks... by whatever means.

One wonders, however, if the people who make such things as Locksmith and Nibbles Away ever... secretly... to themselves... in quiet whispers... complain that the pirates are ripping them off, too. **CN!**

Stockboy III



Warm up your printer, pop in a new ribbon, stick a fresh mouse on the treadmill to drive the paper feeder... the Stockboy printout module has arrived.

by Robert J. Thorne

An important part of any inventory control system is the part that delivers mounds of printouts for the boss to plough through on those long summer weekends. Once you have a database with your inventory all entered and a point of sale function to mark off the inventory that gets sold... we ran 'em in the December 1983 and January 1984 editions of CN! respectively... this is naturally the next thing you'll want. Now you can see what's been sold, what's left and who's bought stuff from you.

Sticky Fingers

Typing this whole program in could be somewhat more of a pain than your fingers will love you for. Fortunately, you have a choice between two major dodges to save typing it all in. Firstly, much of the program is identical to that of the previous modules so if you have those up and running you could steal those bits from them. As with the earlier components of the system, lines 140 and 150 will need to be set to the proper strings to clear the screen and to home the cursor on your computer.

Alternately, you can buy the whole system on disk. Earlier delays in getting the package suitably high tech and ready to send out have been rectified and the entire works is now being shipped.

Once you have the program running it will offer a number of options. You can have sales reports, inventory reports, the mailing list or you can return to the main menu... we'll be getting this latter bit of code in a future issue. Each is chosen by hitting one letter and then the return key. It's designed to be straightforward and easily used by non-programmers.

The sales report option offers two sub-options. Firstly, you can have packing lists, which consist of the customer's name and address followed by the details of what he bought. If you have your own custom form you might want to change the print statements around in this section so as to print this in the format you want. Another option might be to squeeze everything onto a sticky label if you're mailing stuff out.

The other sales report option gives you a list of everything that was bought, along with quantities and prices, and a bottom line with the total number of dollars that should by now be in the cash register.

After the sales report is done the

```
10 '-------------------------------------------------------'
20 '    INVENTORY REPORT MODULE VERSION 2.4                '
30 '    COPYRIGHT (c) 1984 STEVE RIMMER AND ROBERT J. THORNE '
40 '    Not For Sale Without The Authors' Permission       '
50 '    ...available on disk...  for more information      '
60 '    contact CN!, 25 Overlea Blvd, Unit 6, Toronto      '
70 '    Ontario M4H 1B1 (416)-423-3262                     '
80 '-------------------------------------------------------'
90 DEFINT A-Z
100 CR$= CHR$(13) 'CARRIAGE RETURN
110 LF$=CHR$(10)  'STRING TO MOVE DOWN ONE LINE
120 BS$=CHR$(8)   'KEY TO INTERPRET AS BACKSPACE
130 RUB$=CHR$(8)+" "+CHR$(8) 'STRING TO DELETE A CHARACTER
140 CLS$=CHR$(27)+"*" 'STRING TO CLEAR SCREEN
150 HM$=CHR$(30) 'STRING TO HOME CURSOR
160 FF$=CHR$(12) 'STRING TO FORM FEED ON PRINTER
170 CW=35 'COLUMN WIDTH FOR DOUBLE COLUMN MAILING LABELS
180 ALP$=" ABCDEFGHIJKLMNOPQRSTUVWXYZ:;+][-
    1234567890)(*&%$#@!.,?'"
190 UP$=CHR$(5)  'KEY TO INTERPRET AS CURSOR UP
200 DN$=CHR$(24) 'KEY TO INTERPRET AS CURSOR DOWN
210 XX$=CHR$(25) 'KEY TO INTERPRET AS CLEAR THE LINE
220 CON$=UP$+DN$+CR$
230 LI$=" "+STRING$(78," ")
240 NUM$="0123456789."+BS$+CON$+XX$
250 STOCK$="BOOKS.MHD"  'NAME OF FILE TO STORE STOCK IN
260 MAIL$="MAIL.MHD"    'NAME OF FILE TO STORE MAILING LIST IN
270 TEMP$="SCRATCH.$$$" 'NAME OF SCRATCH FILE TO HOLD ORDERS
280 OTEMP$="SCRATCH.BAK" 'NAME OF BACKED-UP OLD SCRATCH FILE
290 LN=40 'LENGTH OF NAME FIELD
300 LS=10 'LENGTH OF SUPPLIER FIELD
310 LI=9  'LENGTH OF INTERNAL CODE FIELD
320 LR=6  'LENGTH OF RETAIL PRICE FIELD
330 LC=6  'LENGTH OF OUR COST FIELD
340 LP=6  'LENGTH OF PROFIT FIELD
350 LM=4  'LENGTH OF MAXIMUM INVENTORY FIELD
360 LT=4  'LENGTH OF CURRENT INVENTORY FIELD
370 LB=4  'LENGTH OF MINIMUM INVENTORY FIELD
380 LX=LN+LS+LI+LR+LC+LP+LM+LT+LB 'LENGTH OF STRING
390 DN=25 'LENGTH OF CUSTOMER NAME FIELD
400 DS=30 'LENGTH OF CUSTOMER STREET ADDRESS FIELD
410 DI=6  'LENGTH OF CUSTOMER APARTMENT NUMBER
420 DR=15 'LENGTH OF CUSTOMER CITY FIELD
430 DC=3  'LENGTH OF CUSTOMER PROVINCE FIELD
440 DP=8  'LENGTH OF CUSTOMER COUNTRY FIELD
450 DW=8  'LENGTH OF POST CODE FIELD
460 DM=LN 'LENGTH OF ITEM FIELD
470 DT=LI 'LENGTH OF INTERNAL CODE FIELD
480 DB=LR 'LENGTH OF RETAIL PRICE FIELD
490 DQ=4  'LENGTH OF QUANTITY FIELD
500 DX=DN+DS+DI+DR+DC+DP+DW
510 DY=DM+DT+DB+DQ
520 GOTO 2930
530 'LINE ENTRY FUNCTION
540 'NEEDS MAXIMUM LENGTH OF ENTRY IN ENT
550 'NEEDS SCREEN LINE NUMBER IN LNE
560 'NEEDS TITLE IN TITLE$
570 A$=""
580 PRINT HM$;
590 PRINT STRING$(LNE,LF$);
600 PRINT TITLE$": [" STRING$(ENT,32) "]" CR$ TITLE$": [" DAT$
    CR$ TITLE$": [";
610 IF PASS0=0 THEN 740
620 C$=INPUT$(1)
630 IF ASC(C$)>ASC("Z") THEN C$=CHR$(ASC(C$)-&H20)
640 WID=LEN(A$)
650 CON=INSTR(CON$,C$)
660 FULL=ENT=WID
670 FLAG=INSTR(ALP$,C$)
680 IF NUM=1 AND INSTR(NUM$,C$)=0 THEN 620
690 IF FLAG AND NOT FULL THEN PRINT C$; : A$=A$+C$ : GOTO 620
700 IF C$=BS$ AND WID>0 THEN PRINT RUB$; : A$=LEFT$(A$,WID-1)
    : GOTO 620
710 IF C$=XX$ THEN PRINT STRING$(WID,RUB$) STRING$(WID," ")
    STRING$(WID,RUB$); : A$="" : GOTO 620
720 IF CON THEN 740
730 GOTO 620
740 NUM=0
750 IF WID=0 THEN 770
760 IF PASS0=1 THEN DAT$=A$+STRING$((ENT-WID)," ")
770 RETURN
780 ' DO TITLE
790 IF LEN(TITLE$)<78 THEN TITLE$=" " + TITLE$ + " " : GOTO
    790
800 PRINT CLS$;
810 PRINT TITLE$
820 PRINT LI$
830 RETURN
840 'READ ITEM NREC FROM STOCK FILE
850 FIELD #1,(LX+1) AS CRACK$
860 GET #1,NREC
870 NME$=LEFT$(CRACK$,LN)
880 PCODE$=MID$(CRACK$,LN+1,LS)
890 MOOR$=MID$(CRACK$,LN+LS+1,LI)
900 RTL$=MID$(CRACK$,LN+LS+LI+1,LR)
910 COST$=MID$(CRACK$,LN+LS+LI+LR+1,LC)
920 PROFIT$=MID$(CRACK$,LN+LS+LI+LR+LC+1,LP)
930 MAX$=MID$(CRACK$,LN+LS+LI+LR+LC+LP+1,LM)
940 CURR$=MID$(CRACK$,LN+LS+LI+LR+LC+LP+LM+1,LT)
950 MIN$=MID$(CRACK$,LN+LS+LI+LR+LC+LP+LM+LT+1,LB)
960 RETURN
970 'READ ITEM NREC FROM TEMP FILE
980 FIELD #1,(DY+10) AS N$
990 GET #1,NREC
1000 THING$=LEFT$(N$,DM)
1010 ICODE$=MID$(N$,DM+1,DT)
1020 CASH$=MID$(N$,DM+DT+1,DB)
1030 REC$=MID$(N$,DM+DT+DB+1,5)
1040 QUAN$=MID$(N$,DM+DT+DB+6,DQ)
1050 GOODREC$=MID$(N$,DM+DT+DB+DQ+6,1)
1060 RETURN
1070 'READ ITEM NREC FROM MAILING LIST FILE
1080 FIELD #1, DX AS M$
1090 GET #1,NREC
1100 GOTO 1140 'USE NEXT ROUTINE TO CRACK M$
1110 'READ ITEM QREC FROM MAILING LIST FILE
1120 FIELD #2,DX AS M$
1130 GET #2,QREC
1140 CNME$=LEFT$(M$,DN)
1150 ADR$=MID$(M$,DN+1,DS)
1160 APT$=MID$(M$,DN+DS+1,DI)
1170 CITY$=MID$(M$,DN+DS+DI+1,DR)
1180 PROV$=MID$(M$,DN+DS+DI+DR+1,DC)
1190 CTRY$=MID$(M$,DN+DS+DI+DR+DC+1,DP)
1200 POST$=MID$(M$,DN+DS+DI+DR+DC+DP+1,DW)
1210 RETURN
1220 'SEND A$ TO PRINTOUT DESTINATION
1230 IF PLINE<=MXLINE THEN 1340 'NOT BOTTOM OF PAGE YET
1240 'NEW PAGE
1250 IF PAGE>0 THEN GOSUB 1370 ELSE IF NOT DEST THEN PRINT
    CLS$;
1260 PLINE=0 : PAGE=PAGE+1
1270 C$=A$ 'SAVE OUTPUT LINE
1280 'PRINT PAGE HEADER
1290 A$=SPACE$(40-LEN(HEAD1$)½2)+HEAD1$ : GOSUB 1340
1300 A$=SPACE$(70)+"PAGE"+STR$(PAGE) : GOSUB 1340
1310 A$=HEAD2$ : GOSUB 1340
1320 A$=STRING$(79,"-") : GOSUB 1340
1330 A$=C$ 'GET LINE TO PRINT BACK AND DO IT
1340 'PRINT A$
1350 IF DEST THEN LPRINT A$ ELSE PRINT A$
1360 PLINE=PLINE+1 : RETURN
1370 'END OF PRINTED PAGE ROUTINE
1380 IF DEST THEN LPRINT FF$; : GOTO 1400
1390 PRINT : PRINT TAB(65) "Hit a key "; : C$=INPUT$(1) :
    PRINT : PRINT CLS$;
1400 RETURN
1410 'SALES REPORTS
1420 TITLE$="SALES REPORTS MENU PAGE" : GOSUB 780
1430 TITLE$="Function: Packing list, Sales report, Go back"
1440 DAT$="P" : PASS0=1 : ENT=1 : LNE=20 : GOSUB 530
```

Stockboy III

```
1450 IF DAT$="G" THEN 1890
1460 IF INSTR("PS",DAT$)=0 THEN 1420
1470 SALES=DAT$="S"
1480 GOSUB 2990 'PRINTER OR SCREEN?
1490 IF DEST=99 THEN 1420 'NEITHER
1500 GOSUB 2720 'OPEN TEMP FILE
1510 GOSUB 2650 'OPEN MAIL FILE
1520 TOTAL!=0 'TOTAL SALES $ (IN
     FLOATING POINT)
1530 'SET UP SCREEN HEADINGS
1540 IF SALES THEN HEAD1$="SALES
     REPORT" ELSE HEAD1$="PACKING
     LISTS"
1550 HEAD2$="INT.CODE  DESCRIPTION
     QUAN PRICE  EXT      *"
1560 FOR NREC=2 TO (TREC-1) 'FOR EACH
     RECORD
1570 GOSUB 970 'GET RECORD
1580 IF SALES THEN 1660 'NO ADDRESS
     NEEDED
1590 QREC=VAL(REC$) : GOSUB 1110 'GET
     NAME AND ADDRESS
1600 IF PLINE+6>MXLINE THEN PLINE=99
     'MAKE SURE ALL GETS ON ONE PAGE
1610 A$=CNME$ : GOSUB 1220
1620 A$=ADR$+" "+APT$ : GOSUB 1220
1630 A$=CITY$+" "+PROV$+" "+CTRY$ :
     GOSUB 1220
1640 A$=POST$ : GOSUB 1220
1650 A$=" " : GOSUB 1220 'BLANK LINE
1660 'PRINT WHAT WAS ORDERED
1670 EX!=VAL(QUAN$)*VAL(CASH$) :
     TOTAL!=TOTAL!+EX!
1680 EXT$=SPACE$(8) : LSET
     EXT$=STR$(EX!)
1690 A$=ICODE$+" "+THING$+" "+QUAN$+"
     "+CASH$+EXT$+"        "+GOODREC$
1700 GOSUB 1220
1710 IF NOT SALES THEN A$=" " : GOSUB
     1220
1720 NEXT
1730 'ALL DONE
1740 CLOSE #1
1750 CLOSE #2
1760 A$=" " : GOSUB 1220 'BLANK LINE
1770 IF SALES THEN A$="***** TOTAL
     SALES = $ "+STR$(TOTAL!) ELSE
     A$="*** END"
1780 GOSUB 1220
1790 GOSUB 1370 'END THE PAGE
1800 'DELETE THE TEMPORARY FILE?
1810 TITLE$="TRANSACTION FILE DELETION
     PAGE" : GOSUB 780
1820 TITLE$="Do you want to delete the
     transaction file?"
1830 DAT$="N" : PASS0=1 : ENT=1 :
     LNE=20 : GOSUB 530
1840 IF DAT$="N" THEN 1890 ELSE IF
     DAT$<>"Y" THEN 1810
1850 OPEN "R",#1,OTEMP$ 'MAKE SURE OLD
     FILE EXISTS...
1860 CLOSE #1 '...BUT CLOSE IT...
1870 KILL OTEMP$ '...SO WE CAN DELETE
     IT
1880 NAME TEMP$ AS OTEMP$ 'MAKE TEMP
     FILE INTO OLD FILE
1890 RETURN
1900 'INVENTORY REPORTS
1910 TITLE$="INVENTORY REPORTS MENU
     PAGE" : GOSUB 780
1920 TITLE$="Function: Reorder list,
     All stock, Go back"
1930 DAT$="R" : PASS0=1 : ENT=1 :
     LNE=20 : GOSUB 530
1940 IF DAT$="G" THEN 2250
1950 IF INSTR("RA",DAT$)=0 THEN 1910
1960 REORD=DAT$="R"
1970 TITLE$="INVENTORY PREFIX SELECTION
     PAGE" : GOSUB 780
1980 TITLE$="Enter Internal Code prefix
     or Return for all"
1990 DAT$=SPACE$(LI) : PASS0=1 : ENT=LI
     : LNE=20 : GOSUB 530
2000 PRELEN=0 : FOR N=1 TO LI : IF
     MID$(DAT$,N,1)<>" " THEN PRELEN=N
2010 NEXT : PREF$=LEFT$(DAT$,PRELEN)
2020 GOSUB 2990 'PRINTER OR SCREEN?
2030 IF DEST=99 THEN 1910 'NEITHER
2040 GOSUB 2700 'OPEN STOCK FILE
2050 'SET UP SCREEN HEADINGS
2060 IF REORD THEN HEAD1$="INVENTORY
     REORDER REPORT" ELSE
```

```
    HEAD1$="INVENTORY MASTER REPORT"
2070 HEAD2$="REC # INT.CODE  SUPPLIER
     DESCR.   /   RETAIL COST   PROFIT
     MAX.Q CUR.Q MIN.Q"
2080 'PRINT EACH LINE
2090 FOR NREC=2 TO TREC
2100 GOSUB 840 'GET AND CRACK RECORD
2110 IF LEFT$(MOOR$,PRELEN)<>PREF$ THEN
2210 'WRONG PREFIX
2120 IF REORD AND VAL(CURR$)>=VAL(MIN$)
     THEN 2210 'ENOUGH QUANTITY
2130 A$=" " : GOSUB 1220 'BLANK LINE
2140 'MAKE SURE BOTH LINES ARE ON SAME
     PAGE
2150 IF PLINE=MXLINE THEN A$=" " :
     GOSUB 1220
2160 NMB$=SPACE$(5) : RSET
     NMB$=STR$(NREC-1) 'FORMAT RECORD
     NUMBER
2170 A$=NMB$+" "+MOOR$+" "+PCODE$+"
     "+NME$ 'FIRST LINE
2180 GOSUB 1220
2190 A$=SPACE$(40)+RTL$+" "+COST$+"
     "+PROFIT$+" "+MAX$+"
     "+CURR$+"  "+MIN$
2200 GOSUB 1220 'SECOND LINE
2210 NEXT
2220 'ALL DONE REPORT
2230 CLOSE #1
2240 GOSUB 1370 'END PAGE
2250 RETURN
2260 'PRINT MAILING LIST
2270 TITLE$="PRINT MAILING LIST MENU
     PAGE" : GOSUB 780
2280 TITLE$="Function: Single column,
     Double column, Go back"
2290 DAT$="S" : PASSO=1 : ENT=1 :
     LNE=20 : GOSUB 530
2300 IF DAT$="G" THEN 2600
2310 IF INSTR("SD",DAT$)=0 THEN 2270
2320 DOUBLE=DAT$="D"
2330 GOSUB 2990 'PRINTER OR SCREEN?
2340 IF DEST=99 THEN 2270 'NEITHER
2350 GOSUB 2680 'OPEN FILE
2360 IF NOT DEST THEN PRINT CLS$; 'NO
     OTHER SETUP
2370 GOSUB 2610
2380 FOR NREC=2 TO (TREC-1) 'FOR EACH
     RECORD
2390 GOSUB 1070 'READ THAT RECORD
2400 IF NREC=TREC-1 THEN DOUBLE=0 :
     GOSUB 2610 'CATCH LAST REC
2410 IF OVER THEN 2490
2420 A$=LN1$+CNME$ : GOSUB 1340
2430 A$=LN2$+ADR$ : GOSUB 1340
2440 A$=LN3$+APT$ : GOSUB 1340
2450 A$=LN4$+CITY$+" "+PROV$+" "+CTRY$
     : GOSUB 1340
2460 A$=LN5$+POST$ : GOSUB 1340
2470 A$=" " : GOSUB 1340
2480 GOTO 2550
2490 'DO LEFT SIDE OF DOUBLE COLUMN
2500 LN1$=SPACE$(CW) : LSET LN1$=CNME$
2510 LN2$=SPACE$(CW) : LSET LN2$=ADR$
2520 LN3$=SPACE$(CW) : LSET LN3$=APT$
2530 LN4$=SPACE$(CW) : LSET
     LN4$=CITY$+" "+PROV$+" "+CTRY$
2540 LN5$=SPACE$(CW) : LSET LN5$=POST$
2550 IF DOUBLE THEN OVER=NOT OVER
2560 NEXT
2570 'ALL DONE PRINTOUT
2580 CLOSE#1
2590 GOSUB 1370 'END OF PAGE
2600 RETURN
2610 'SET UP COLUMN MODE
2620 OVER=DOUBLE 'FLAG TO PRINT DOUBLE
     COLUMN
2630 LN1$="" : LN2$="" : LN3$="" :
     LN4$="" : LN5$=""
2640 RETURN
2650 'OPEN MAIL FILE FOR PACKING LABEL
     PRINT
2660 OPEN "R",#2,MAIL$
2670 RETURN 'ASSUME IT'S OK
2680 'OPEN MAIL FILE FOR LABEL PRINT
2690 FILE$=MAIL$ : GOTO 2740
2700 'OPEN STOCK FILE
2710 FILE$=STOCK$ : GOTO 2740
2720 'OPEN TEMP FILE
2730 FILE$=TEMP$ 'FALL THROUGH TO NEXT
     ROUTINE
2740 'OPEN FILE NAMED IN FILE$, RETURN
```

Stockboy III

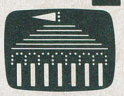
```
2750 N$=SPACE$(6)
2760 OPEN "R",#1,FILE$
2770 FIELD #1,6 AS N$
2780 GET #1,1
2790 TREC=VAL(N$)
2800 IF TREC>0 THEN 2850
2810 'FILE IS NO GOOD
2820 TITLE$="BAD FILE PAGE" : GOSUB 780
2830 TITLE$="FATAL ERROR: The file '"+FILE$+"' contains no
     data. Hit any key."
2840 LNE=20 : ENT=1 : DAT$="." : PASSO=1 : GOSUB 530 : STOP
2850 RETURN
2860 'GO BACK TO MAIN MENU
2870 PASSO=1
2880 TITLE$="RETURN TO MAIN MENU" : GOSUB 780
2890 LNE=20 : ENT=1 : DAT$="N" : TITLE$="Do you want to return
     to the main menu" : GOSUB 530
2900 IF INSTR("YN",DAT$)=0 THEN 2890
2910 IF DAT$="Y" THEN RUN "MENU"
2920 RETURN
2930 'MAIN PROGRAM GOES HERE
2940 TITLE$="REPORT SUBSYSTEM MAIN MENU PAGE" : GOSUB 780
2950 TITLE$="Function: Sales reports, Inventory reports, Print
     mailing list, Menu"
2960 DAT$="S" : PASSO=1 : ENT=1 : LNE=20 : GOSUB 530
2970 ON INSTR("SIPM",DAT$) GOSUB 1410,1900,2260,2860
2980 GOTO 2940
2990 'GO FOR IT MENU PAGE
3000 TITLE$="GO FOR IT MENU PAGE" : GOSUB 780
3010 TITLE$="Function: Screen, Printer, Go back"
3020 DAT$="S" : PASSO=1 : ENT=1 : LNE=20 : GOSUB 530
3030 ON INSTR("SPG",DAT$)+1 GOTO 3000,3050,3050,3040
3040 DEST=99 : RETURN
3050 DEST=DAT$="P"
3060 IF DEST THEN MXLINE=60 ELSE MXLINE=20
3070 PAGE=0 : PLINE=99
3080 RETURN
```

module will give you the option of deleting the transaction file. This eliminates record of the transactions, or rather, renames it as a BAK file, but of course leaves the modified inventory and the mailing list intact. This way, you don't see the same transactions over and over again every time you print sales reports.

The inventory report option offers two sub-options as well. You can print up a reorder list, which lists just those items whose current quantity is less than the minimum quantity, or you can list everything regardless of quantity. The next option allows you to give an internal code prefix to be matched. The idea here is that the first part of the internal code you use might tell you who the manufacturer is or what kind of thing it is. **CN!**

Feature Products at Computer Fair

May 10, 11, 12 13



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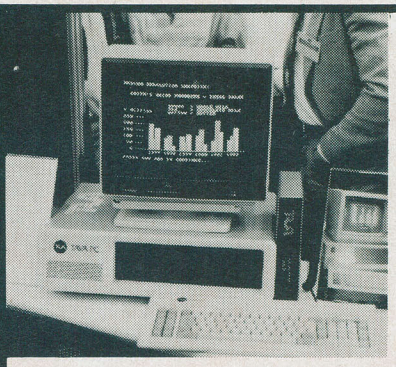

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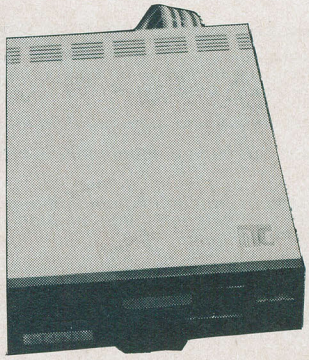

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Software to be bundled with the computer includes dBase II, Electric Pencil PC, as well as Perfect Calc.

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The most difficult thing about understanding new software is understanding how you're going to pay for it. Even simple programs cost a mint. Thus it was that we were pretty fascinated to find that there is a vast library of really good software in the public domain.

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Unfortunately for many users, public domain software is very hard to find sources for. For this reason, we have created the Computing Now! Almost Free Software Offer.

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- *MODEM7* **This program will allow you to communicate with any CP/M based system and download files. See the article in this month's CN! for complete details. MODEM7 will be provided in versions for each system.**
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- *DUU* **The ultimate disk utility; this program allows you to recover accidentally erased disk files, fix gorched files, rebuild and modify your system. We recently saved a 300K dBase II file with this little gem.**
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In addition to the above, we will be providing Apple users with a program which can be used to patch the Apple CP/M BIOS to increase the display speed of the popular Videx eighty column card. Users of other formats will receive ALIENS11, a fairly fiendish video game package . . . which is too large to get on an Apple disk.

Some or all of these files may be provided squeezed in order to accommodate your disk format. While we make every effort to ensure that the programs are completely debugged, we can offer no guarantee that they will function properly for your application.

Our almost free volume one is available for the Apple II + running CP/M, the Nelma Persona and the Osborne for $12.95 per disk and on eight inch single sided single density diskettes for $16.95. Ontario residents please add seven percent provincial sales tax. The files are provided on pristine brand new high quality disks which are fully formatted and checked out prior to shipment.

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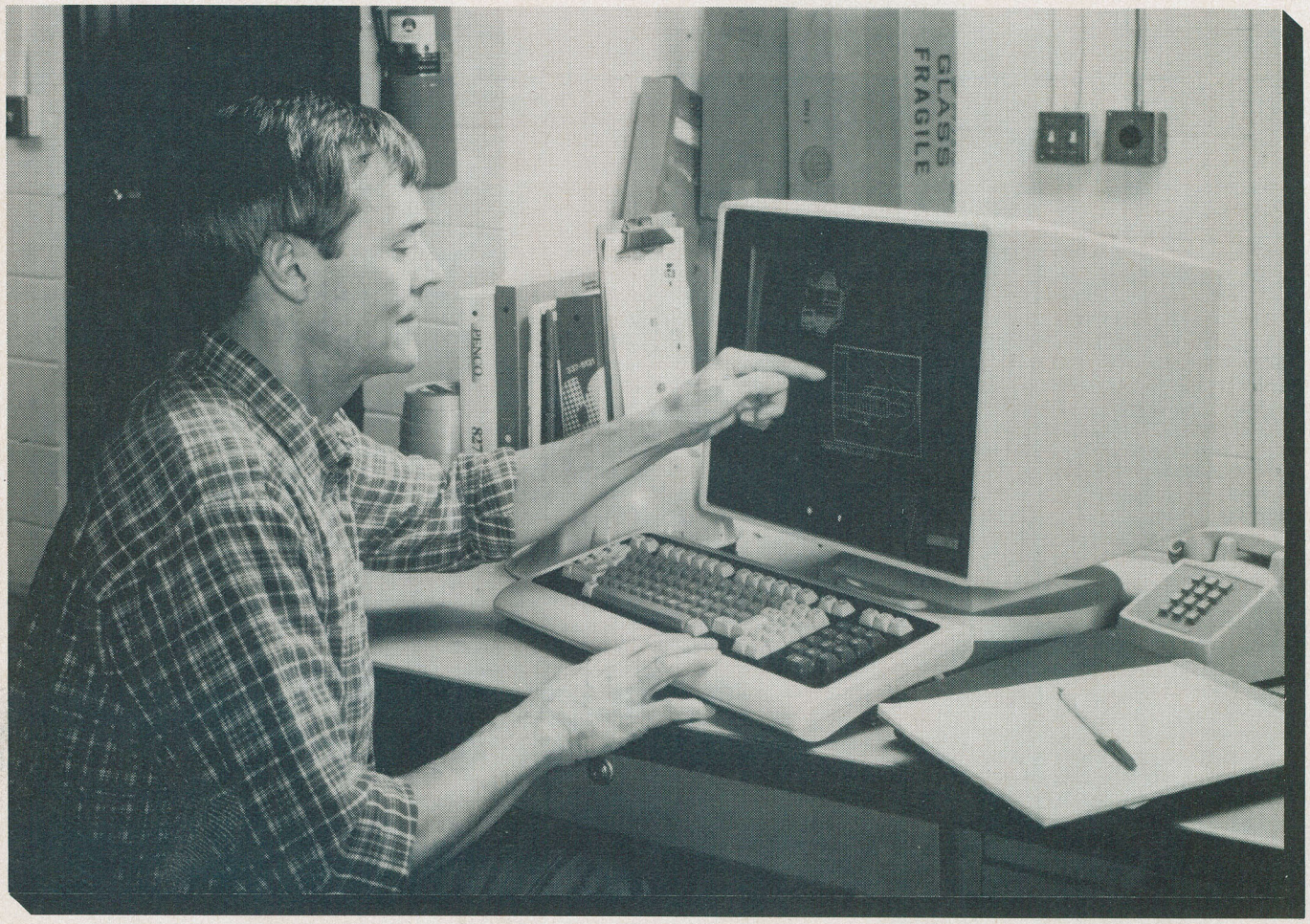
Also see Software II on page 37

Charts Unlimited



Computer generated graphics are really nice way to get your thoughts on paper. Here's a package for the Apple][+ that will let you get things in line.

by Brian Greiner

Have you ever wanted a program that would allow you to easily draw up a chart or a graph? It needn't have been anything too fancy, mind you, but pencil and paper is so low tech. This would seem like the sort of thing someone should write an applications package for.

In fact, someone has.

Charts Unlimited is a graphics program for the creation of charts, graphs and diagrams of any type. The size of the virtual worksheet is one hundred and twenty-three columns by ninety rows and the resulting diagram can be stored on disk or printed out on a printer. There is a pre-defined library of thirty-six shapes, essentially geometric designs, mathematical symbols and bar graph shadings, and thirty-six symbols... Greek letters, flowchart primitives and so forth. As well, the user can create a library of shapes to suit the task at hand.

User defined libraries can be stored on disk and recalled as needed. The pre-defined symbols can be stretched, shrunk, and otherwise mistreated.

A Thousand Words

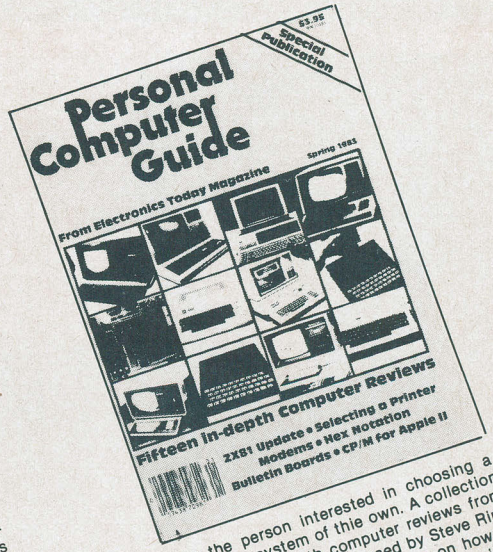
Charts Unlimited graphs are created by manipulating a cursor through single key keyboard commands. There are even built-in help screens summarizing the system's command options. The display shown on the CRT is only one sixteenth of the total worksheet, but the VIEW command can be used to condense and display the entire worksheet in one corner of the CRT display.

The program is well thought out and simple to use. The documentation is quite good. However, to be honest, when I first tried out the package my first impression was "cute, but so what?". Then I decided to give it another try before panning it in print and used it to create a schematic of a RAM board. I created my own library of logic symbols, got used to controlling the cursor, and to my surprise I really liked it! This can be a really a useful piece of software, sort of a poor man's CAD system.

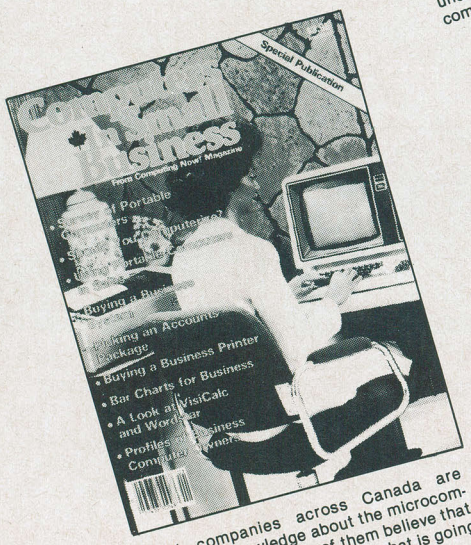
The printouts from Charts look quite good, certainly good enough for most of my documentation requirements. The printer must be a dot matrix type; the software supports some fourteen different printers and eighteen different printer interface cards.

The user-defined symbols are created by manipulating the pre-defined shapes or by creating stick drawing figures. The resulting figures can sometimes be less than perfect, but they usually get the idea across. See, for example, the set of electronic and logic symbols I created. This is not, perhaps, the best example of the powers of the software, but it is one that a number of readers might be interested in. This library of symbols was used to create a complete schematic for an 8K expansion RAM card for the VIC computer. *[This feature ap-*

Your First Computer is a special guide from **Computing Now!** magazine for people who would like to get into computers but don't know where to begin. The publication includes articles on buying your first computer, buying a computer secondhand, a section on computer languages for beginners, surveys of computers and printers under $1000.00, and a complete glossary of computer terms.



For the person interested in choosing a computer system of thie own. A collection of fifteen in-depth computer reviews from ETI magazine, as composed by Steve Rimmer. Also included are articles on how to buy a printer, the intricacies of hexadecimal notation, and an appraisal of the current boom in modems and bulletin boards.



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Charts Unlimited

peared in the February 1984 edition of Computing Now! .ed]

The drawing uses the full size of the worksheet. The printout can be expanded, but in this case a wider printer would have been required to prevent truncation of the diagram. The printout of the logic symbols is, for example, printed double width. The schematic took me between one and a half to two hours to complete.

There are some limitations to the software. The biggest is that neither the final diagram nor the user-defined symbols can be manipulated to any great extent. The user-defined symbols can be moved around but they cannot be stretched or shrunk like the pre-defined ones. Portions of the final diagram can be replicated or erased but it cannot be moved, stretched, or shrunk. As such, the system is not really an electronic drafting board so much as it is like a series of paste-on templates that can be slapped down and interconnected.

The biggest application of the software is for the creation of charts and graphs. The example in the package's instruction book is the creation of an organizational chart. Flowcharts are also a good use for this program.

Real Worlds

Despite a fairly favourable impression of the Charts package, I did have a few beefs. First of all, the list of printers and interfaces supported by the system is not presented anywhere except in the installation software help files. You have to buy the thing before you can find out whether it will work with your hardware.

The second complaint is much more serious. The first couple of times I booted the disk it ran with no problems. Then it began to experience difficulty loading the main program; it just would not boot. All my other programs worked as well as they always had and the questionable disk behaved the same way on a friend's system, so my hardware wasn't at fault.

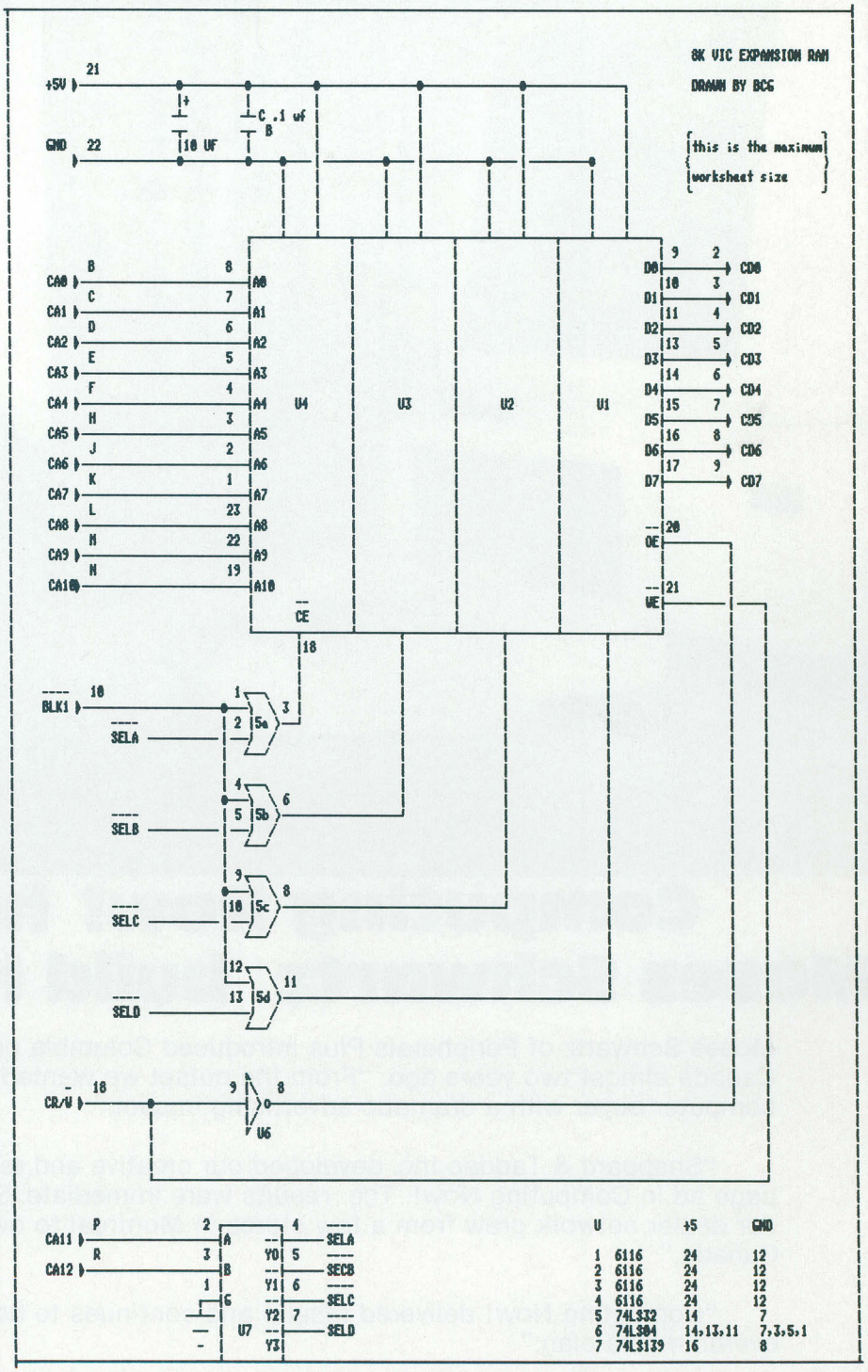
After a while I decided that the disk was slowly curling up its toes and did what one normally does in this case. I tried to back it up.

The software is copy protected.

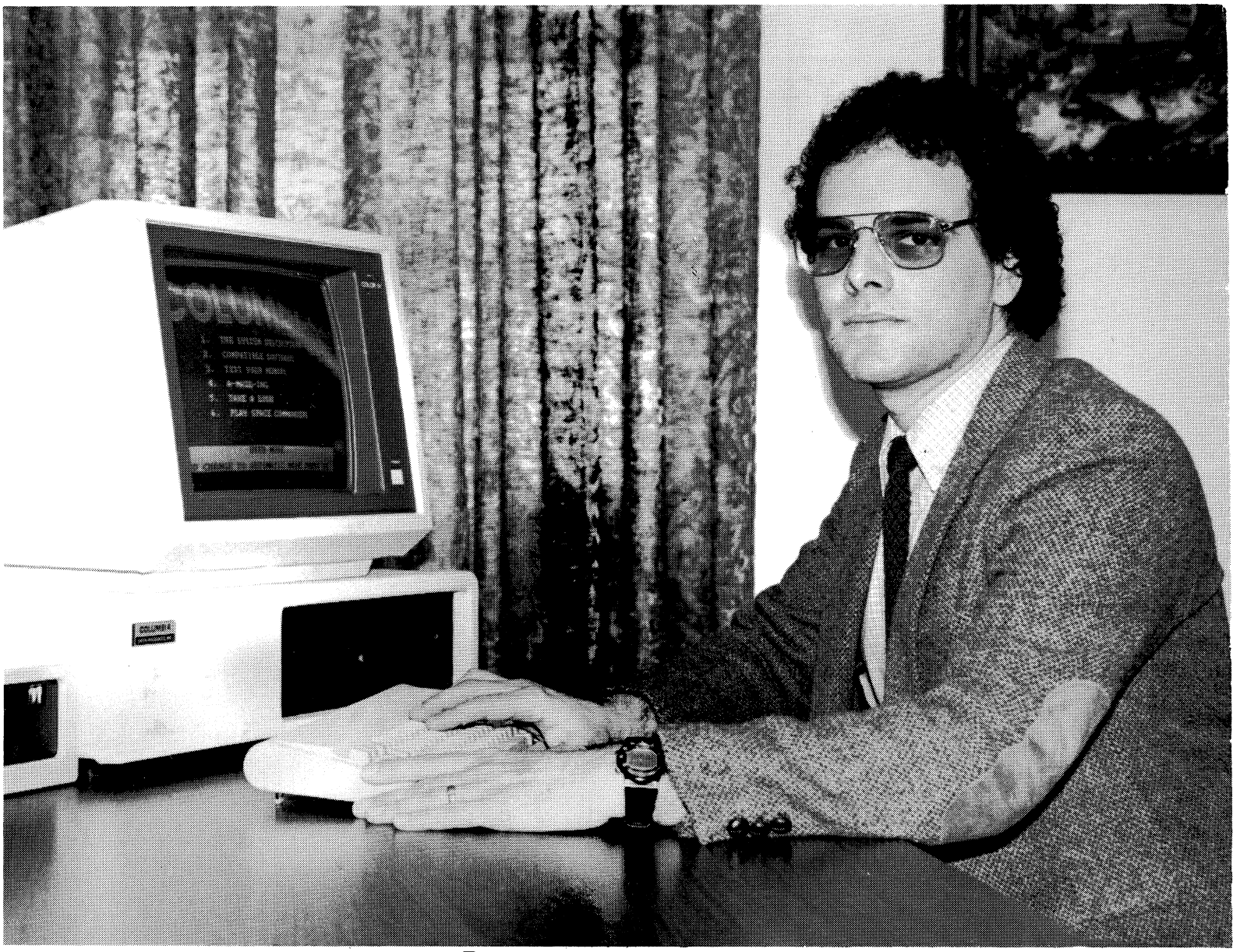
For the sort of money this software costs, one should be able to make a backup copy of it. After all, if one were to start using it to create a lot of diagrams it would get used an awful lot. If manufacturers must copy protect their software, they should at least use good quality disks.

Overall, Charts Unlimited is a nifty little package that would be of use for anyone that needs to make charts, diagrams, schematics and other sorts of hard copy graphics and cannot afford a full blown CAD system. It has its limitations, of course, but within those limitations it's a powerful tool.

One should, however, also ask if it's worth the price. I don't think so. While it has everything together, it simply doesn't offer the user enough to warrant costing around two hundred dollars Canadian. There are packages in this price range which are closer to being complete CAD systems. **CN!**



This is a typical chart . . . it's a memory expansion for the VIC-20. Note the custom symbols.



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For further information, contact Ms. Gabrielle Minot, Network Consulting Inc., Discovery Park, Suite 110, 3700 Gilmore Way, British Columbia V5G 4M1 Tel. (614) 430-3466.

Circle No.60 on Reader Service Card

New Applications

Data General (Canada) Inc. announced today that it has added the popular microcomputing software applications, FRIDAY! and dBASE II from Ashton-Tate, to the list of MS-DOS and CP/M-86 industry standard software that is now available for its desktop generation computer.

Ashton-Tate's dBASE II is a relational database utility. FRIDAY! is an integrated electronic file management system. Both are among the best-selling personal productivity tools available for microcomputers.

Data General's DESKTOP GENERATION Model 10 is a dual-processor, multi-terminal microcomputer suited to both small businesses and large organization.

More information may be had from Data General (Canada) Inc., at 2155 Leanne Blvd., Mississauga, Ontario L5K 2K8 or by calling (416) 823-7830.

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Mini Floppies

Memorex has announced the immediate availability of industry compatible three and one half inch micro disks. The Memorex micro disk is encased in a sturdy protective plastic cartridge with a slide action door for complete protection of the media. Rigidity is enhanced by a metal hub. This protection results in faster transfer increased data integrity, and eventually increased capacities. (up to five megabytes).

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New Products

Memorex Canada supplies a full range of computer magnetic media and storage devices to the Canadian computer market. Direct enquires can be made by calling 1-800-268-9886 or speaking to your local representative.

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Hard Disk Portable

Corona Data Systems, Inc. has announced the addition of a portable hard disk-based personal computer to its popular family of sixteen bit IBM PC-compatible microcomputers.

The PPCXT, like other models in the Corona family, is compatible with virtually all software applications independently developed for the IBM Personal Computer. It addresses user requirements for greater disk storage and it offers a host of standard features and expansion capabilities.

The Corona PPCXT incorporates a half-height, five and a quarter inch ten megabyte Winchester disk drive in the slot where a second floppy drive is located in the company's floppy-based portable P.C. The base unit includes an Intel 8088 CPU, two hundred and fifty-six kilobytes RAM a ten megabyte hard disk drive, a three hundred and sixty K drive, hard disk controller, RS-232C serial port, Centronics-compatible parallel port, detachable eighty-three key IBM PC-compatible keyboard, four IBM PC-compatible expansion slots and graphics resolution of six hundred and forty by three hundred and twenty-five pixels.

Bundled software includes MS-DOS, Release 2.0, GW Basic, MultiMate word processor and PC Tutor self-teaching program.

For more information contact Corona Data Systems, 31324 via Colinas, Suite 110, Westlake Village, CA 91361 (213) 706-1505.

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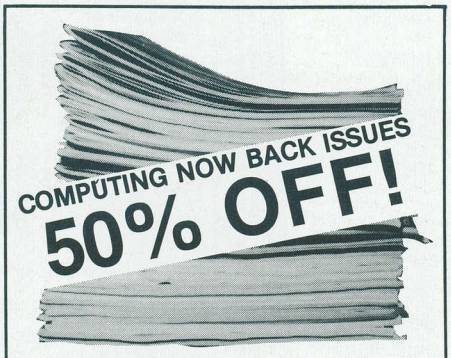

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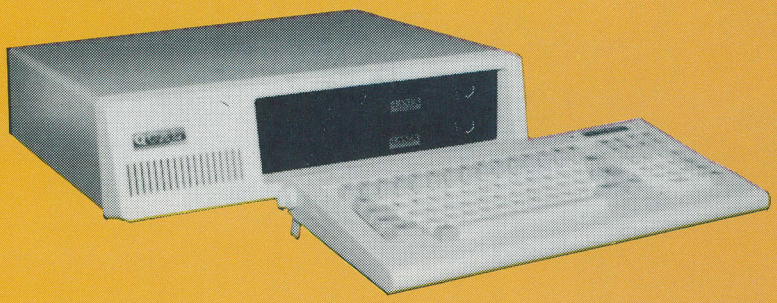

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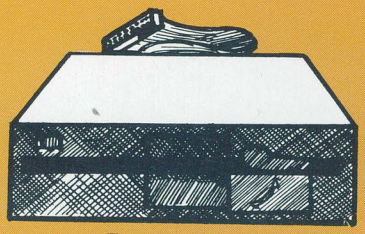

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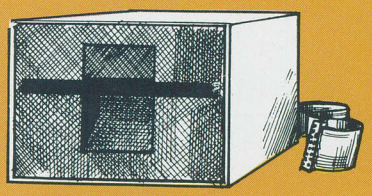

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Mastertype	(8-adult)	65.	**59.**
Type Attack	(6-12)	52.	**45.**
Early Games for Young Children	(2½-6)	39.	**29.**
Early Games for Piece of Cake	(7-15)	39.	**29.**
Game Show	(6-adult)	49.	**39.**
Wizard of Words	(5-adult)	49.	**39.**
Master Match	(6-adult)	49.	**39.**

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Bank Street Writer	$ 90.	$ 69.95
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Wordstar w/free CPM card	595.	429.95
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Spreadsheet		
Visicalc 3.3	325.	239.95
Multiplan	320.	299.95
Supercalc 111	495.	389.95
Database		
PFS file/report/graph	165.	129.95
dBase 11	895.	499.95
DB Master	449.	299.95
Utility/Business		
Locksmith 5.0	159.	139.95
Quick code	395.	299.95
Sensible Speller	159.	129.95
Home Accountant	99.	79.95
Games		
Choplifter	45.	34.95
Temple of Apshai	52.	34.95
Sargon 111	69.	49.95
Zork 1, 11, 111	52.	34.95
Miner 2049ER	52.	34.95
Ultima 11	79.	54.95
Night Mission Pinball	52.	34.95
Flight Simulator 11	65.	49.95
MS. Pac Man	45.	34.95
Educational		
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Reader Rabbit	52.	39.95
Terrapin Logo	180.	129.95
Master Type	52.	34.95
Coast to Coast	65.	49.95
Snooper Troops, 1, 11	52.	39.95

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	REG. PRICE	CJ'S PRICE
16K RAM Card	$ 85.	$ 79.
Disk controller card	85.	69.
80 column card	95.	89.
Z-80 card (no software)	115.	89.
KoalaPad Touch Tablet	175.	139.
Wildcard 11	199.	159.
Hayes Mach 11 Joytstick	59.	49.
TG paddles	59.	39.
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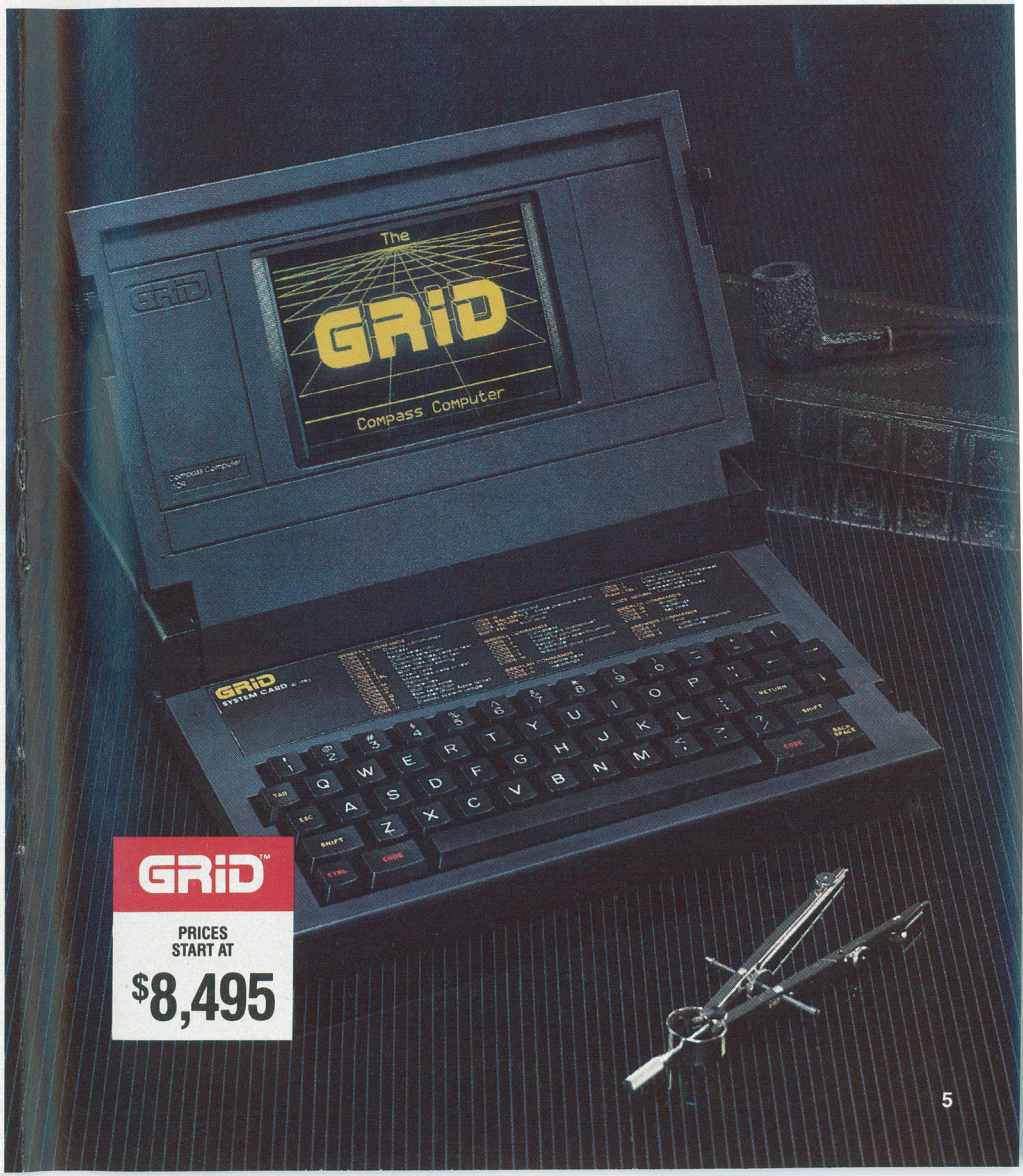

TAVA PC

- Runs under DOS 1.1, 2.0, CP/M86 AND P-System.
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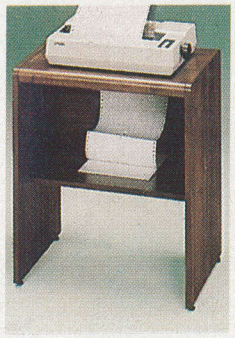

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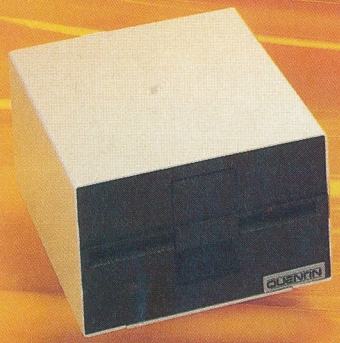

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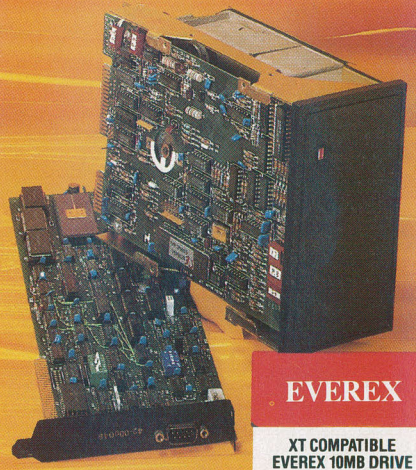

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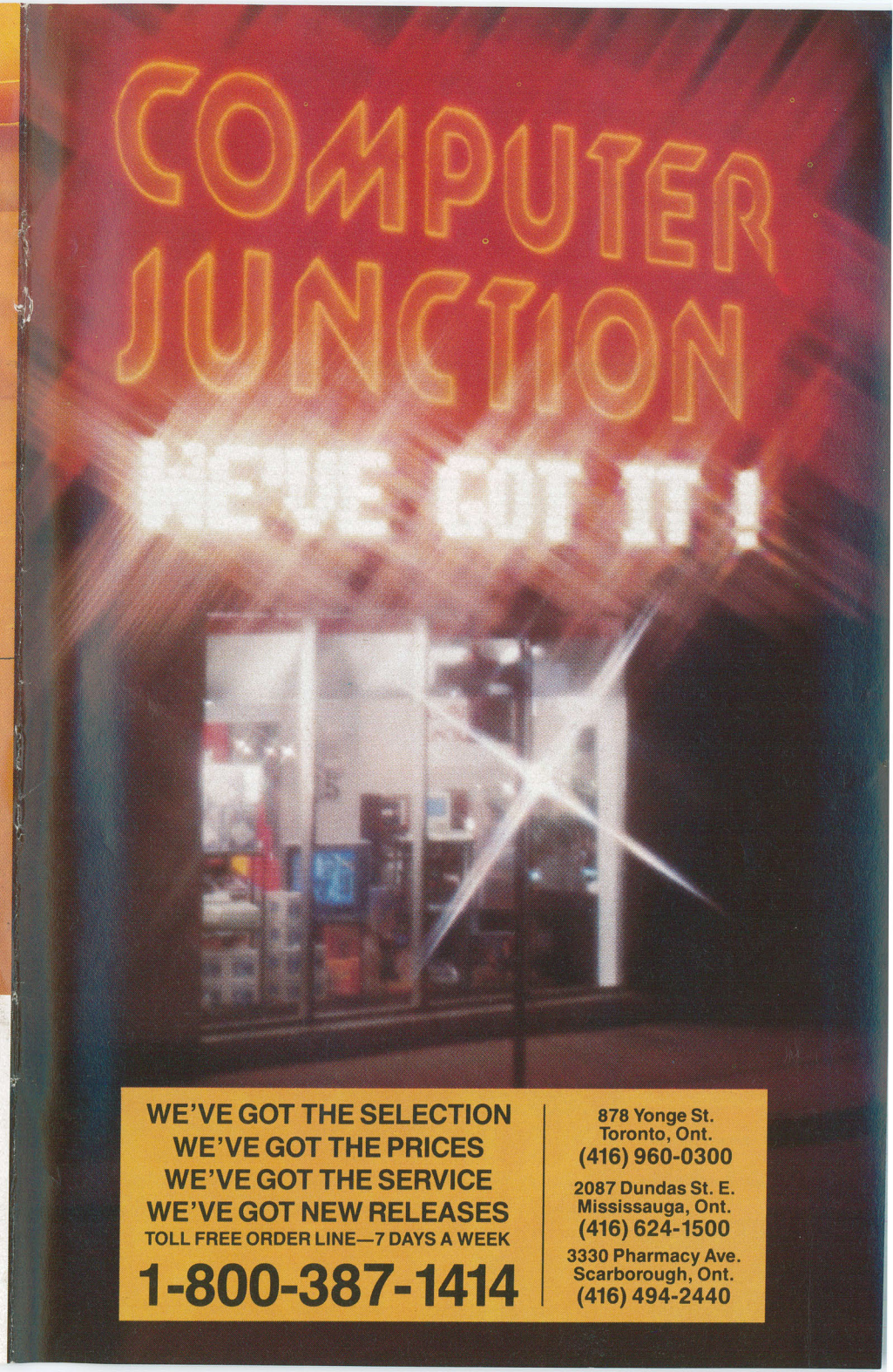

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